

# Direct connection Shared Library (DLL) for OpenDSS

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*Created by Davis Montenegro*

The direct connection shared library is a DLL that implements the same classes, properties and methods of the OpenDSS COM interface. This alternative was generated to accelerate the In-process co-simulation between OpenDSS and external software when the client software does not supports early bindings connection to COM servers/controls.

Normally, high level programming languages do not support early bindings, which make them use late bindings for data exchanging with COM servers. Late bindings procedures adds an important overhead to the co-simulation process specially when executing loops.

So, if your programming language does not supports early bindings connection with COM servers, this is the library you should use to accelerate your simulations. This library is called OpenDSSDEngine.dll, and can be accessed directly without needing to register it into the OS registry.

However, if your programming language supports early bindings, keep using the COM interface, the simulation speed will be accelerated naturally when using this connection procedure instead of late bindings.

The properties implemented in this library are the same implemented in the COM interface, so, this manual can be used as a reference manual for the classes, properties and methods included in the COM interface.

## DSS Interface

This interface implements the DSS interface (IDSS) of OpenDSS by declaring 3 procedures for accessing the different properties included in this interface.

## DSSI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t DSSI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: DSS.NumCircuits*

This parameter gets the number of circuits currently defined.

*Parameter 1: DSS.ClearAll*

This parameter clears all circuit definitions.

*Parameter 2: DSS.ShowPanel*

This parameter shows non-MDI child form of the Main DSS Edit form.

*Parameter 3: DSS.Start*

This parameter validate the user and start the DSS. Returns TRUE (1) if successful.

*Parameter 4: DSS.NumClasses*

This parameter gets the number of DSS intrinsic classes.

*Parameter 5: DSS.NumUserClasses*

This parameter gets the number of user-defined classes.

*Parameter 6: DSS.Reset*

This parameter resets DSS initialization for restarts, etc. from applets.

*Parameter 7: DSS.AllowForms read*

This parameter gets if the DSS allows forms (1) or not (0), default (1).

*Parameter 8: DSS.AllowForms write*

This parameter sets if the DSS allows forms (1) or not (0), default (1).

## **DSSS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr DSSS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: DSS.NewCircuit*

This parameter makes a new circuit, the name of the circuit must be specified in the Argument.

*Parameter 1: DSS.Version*

This parameter gets the version string for the DSS.

*Parameter 2: DSS.DataPath read*

This parameter gets the Data File Path. Default for reports, etc. from DSS.

*Parameter 3: DSS.DataPath write*

This parameter sets the Data File Path. Default for reports, etc. from DSS.

*Parameter 4: DSS.DefaultEditor*

This parameter gets the path name for the default text editor.

## **DSSV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void DSSV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: DSS.Classes*

This parameter gets the list of DSS intrinsic classes (names of the classes).

*Parameter 1: DSS.UserClasses*

This parameter gets list of user-defined classes (names of the classes).

## CktElement Interface

This interface implements the CktElement interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### CktElementI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t CktElementI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: CktElement.NumTerminals*

This parameter will deliver the number of terminals of the active DSS object.

*Parameter 1: CktElement.NumConductors*

This parameter will deliver the number of conductors of the active DSS object.

*Parameter 2: CktElement.NumPhases*

This parameter will deliver the number of phases of the active DSS object.

*Parameter 3: CktElement.Open*

This parameter will *open* the specified terminal (Argument) of the active DSS object.

*Parameter 4: CktElement.Close*

This parameter will *close* the specified terminal (Argument) of the active DSS object.

*Parameter 5: CktElement.IsOpen*

This parameter will return a 1 if any terminal of the active DSS object is open, otherwise, it will return a 0.

*Parameter 6: CktElement.NumProperties*

This parameter will return the number of properties of the active DSS object.

*Parameter 7: CktElement.HasSwitchControl*

This parameter will return 1 if the active DSS object has a Switch Control linked; otherwise, it will return 0.

*Parameter 8: CktElement.HasVoltControl*

This parameter will return 1 if the active DSS object has a Volt Control linked; otherwise, it will return 0.

*Parameter 9: CktElement.NumControls*

This parameter will return number of controls linked to the active DSS object.

*Parameter 10: CktElement.OCPDevIndex*

This parameter will return the Index into Controller list of OCP Device controlling the active DSS object.

*Parameter 11: CktElement.OCPDevType*

This parameter will return one of the following values: 0=none; 1=Fuse; 2=Recloser; 3=Relay according to the type of active control.

*Parameter 12: CktElement.Enabled - read*

This parameter will return one of the following values: 0 if the active element is disabled or 1 if the active element is enabled.

*Parameter 13: CktElement.Enabled - Write*

This parameter allows to modify the enabled status of the active element (1=enabled, 0=disabled).

## **CktElementF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double CktElementF(int32_t Parameter, double Argument);
```

This interface returns a float (IEEE 754 64 bits) with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: CktElement.NormalAmps - read*

This parameter will deliver the normal ampere rating for the active PDElement.

*Parameter 1: CktElement.NormalAmps - Write*

This parameter allows to fix the normal ampere rating for the active PDElement. The new value must be defined in the variable "Argument".

*Parameter 2: CktElement.EmergAmps - read*

This parameter will deliver the Emergency ampere rating for the active PDElement.

*Parameter 3: CktElement.EmergAmps - Write*

This parameter allows to fix the Emergency ampere rating for the active PDElement. The new value must be defined in the variable "Argument".

*Parameter 4: CktElement.Variablei*

This parameter delivers get the value of a variable by index for the active PCElement.

## **CktElementS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr CktElementS(int32_t Parameter, CStr Argument);
```

This interface returns a string (pAnsiChar) with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: CktElement.Name*

This parameter delivers the full name of the active circuit element.

*Parameter 1: CktElement.Display - read*

This parameter display the name of the active circuit element (not necessarily unique).

*Parameter 2: CktElement.Display - write*

This parameter allows to modify the name of the active circuit element (not necessarily unique).

*Parameter 3: CktElement.GUID*

This parameter delivers the unique name for the active circuit element.

*Parameter 4: CktElement.EnergyMeter*

This parameter delivers the name of the EnergyMeter linked to the active circuit element.

*Parameter 5: CktElement.Controller*

This parameter delivers the Full name of the i-th controller attached to the active circuit element. The i-th controller index must be specified in the argument *arg*. Ex: Str = Controller(2). See NumControls to determine valid index range.

## **CktElementV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr CktElementS(int32_t Parameter, CStr Argument);
```

This interface returns a variant (the format depends on the parameter) with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: CktElement.BusNames - read*

This parameter delivers an array of strings with the names of all the buses connected to the active circuit element.

*Parameter 1: CktElement.BusNames - write*

This parameter allows to fix an array of strings with the names of all the buses connected to the active circuit element.

*Parameter 2: CktElement.Voltages*

This parameter delivers an array of doubles with the voltages at terminals of the active circuit element.

*Parameter 3: CktElement.Currents*

This parameter delivers an array of doubles with the currents at terminals of the active circuit element.

*Parameter 4: CktElement.powers*

This parameter delivers an array of doubles with the powers at terminals of the active circuit element.

*Parameter 5: CktElement.Losses*

This parameter delivers an array of doubles with the Losses at terminals of the active circuit element.

*Parameter 6: CktElement.PhaseLosses*

This parameter delivers an array of doubles with the Losses per phase at the terminals of the active circuit element.

*Parameter 7: CktElement.SeqVoltages*

This parameter delivers an array of doubles with the symmetrical component voltages per phase at the terminals of the active circuit element.

*Parameter 8: CktElement.SeqCurrents*

This parameter delivers an array of doubles with the symmetrical component Currents per phase at the terminals of the active circuit element.

*Parameter 9: CktElement.SeqPowers*

This parameter delivers an array of doubles with the symmetrical component powers per phase at the terminals of the active circuit element.

*Parameter 10: CktElement.AllPropertyNames*

This parameter delivers an array of strings with the names of all the properties of the active circuit element.

*Parameter 11: CktElement.Residuals*

This parameter delivers an array of doubles with the residual currents (magnitude, angle) in all the nodes of the active circuit element.

*Parameter 12: CktElement.YPrim*

This parameter delivers an array of doubles with the Y primitive matrix (complex) of the active circuit element.

*Parameter 13: CktElement.CplxSeqVoltages*

This parameter delivers an array of doubles with the complex of sequence voltages for all terminals of the active circuit element.

*Parameter 14: CktElement.CplxSeqCurrents*

This parameter delivers an array of doubles with the complex of sequence currents for all terminals of the active circuit element.

*Parameter 15: CktElement.AllVariableNames*

This parameter delivers a Variant array of strings listing all the published state variable names, if the active circuit element is a PCElement. Otherwise, null string.

*Parameter 16: CktElement.AllVariableValues*

This parameter delivers a Variant array of doubles listing all the values of the state variables, if the active circuit element is a PCElement. Otherwise, null string.

*Parameter 17: CktElement.Nodeorder*

This parameter delivers a Variant array integers variant array of integer containing the node numbers (representing phases, for example) for each conductor of each terminal.

*Parameter 18: CktElement.CurrentsMagAng*

This parameter currents in magnitude, angle format as a variant array of doubles of the active circuit element.

*Parameter 19: CktElement.VoltagesMagAng*

This parameter voltages in magnitude, angle format as a variant array of doubles of the active circuit element.

## Error Interface

This interface implements the Error interface of OpenDSS by declaring 2 procedures for accessing the different properties included in this interface.

### ErrorCode (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t ErrorCode(void );
```

This interface returns an integer with latest error code delivered by OpenDSS.

### ErrorDesc (String) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr ErrorDesc(void );
```

This interface returns a string with description of the latest error code delivered by OpenDSS.

## Circuit Interface

This interface implements the Circuit (ICircuit) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### CircuitI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t CircuitI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer according to the number sent in the variable "parameter". The parameter can be one of the following:

*Parameter 0: Circuit.NumCktElements*

This parameter will deliver the number of CktElements included in the active circuit.

*Parameter 1: Circuit.NumBuses*

This parameter will deliver the number of buses included in the active circuit.

*Parameter 2: Circuit.NumNodes*

This parameter will deliver the number of nodes included in the active circuit.

*Parameter 3: Circuit.FirstPCElement*

This parameter sets the first PCElement to be the active PCElement, as a result, this parameter will deliver the index of the active PCElement (ideally 1).

*Parameter 4: Circuit.NextPCElement*

This parameter sets the next PCElement to be the active PCElement, as a result, this parameter will deliver the index of the active PCElement (if there is no more it will return a 0).

*Parameter 5: Circuit.FirstPDElement*

This parameter sets the first PDElement to be the active PDElement, as a result, this parameter will deliver the index of the active PDElement (ideally 1).

*Parameter 6: Circuit.NextPDElement*

This parameter sets the next PDElement to be the active PDElement, as a result, this parameter will deliver the index of the active PDElement (if there is no more it will return a 0).

*Parameter 7: Circuit.Sample*

This parameter forces all meters and monitors to take a sample, returns 0.

*Parameter 8: Circuit.SaveSample*

This parameter forces all meters and monitors to save their sample buffers, returns 0.

*Parameter 9: Circuit.SetActiveBusi*

This parameter sets active the bus specified by index, which is compatible with the index delivered by AllBusNames, returns 0 if everything ok.

*Parameter 10: Circuit.FirstElement*

This parameter sets the first Element of the active class to be the active Element, as a result, this parameter will deliver the index of the active Element (0 if none).

*Parameter 11: Circuit.NextElement*

This parameter sets the next Element of the active class to be the active Element, as a result, this parameter will deliver the index of the active Element (0 if none).

*Parameter 12: Circuit.UpdateStorage*

This parameter forces all storage classes to update. Typically done after a solution.

*Parameter 13: Circuit.ParentPDElement*

This parameter sets parent PD Element, if any, to be the active circuit element and returns index > 0 if it fails or not applicable.

*Parameter 14: Circuit.EndofTimeStepUpdate*

This parameter calls end of time step cleanup routine in solutionalgs.pas. Returns 0.

## **CircuitF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double CircuitF(int32_t Parameter, double Argument1, double Argument2);
```

This interface returns a floating point number (IEEE754 64 bits) according to the number sent in the variable "parameter". The parameter can be one of the following:

*Parameter 0: Circuit.Capacity*

This parameter returns the total capacity of the active circuit. Or this parameter it is necessary to specify the start and increment of the capacity in the arguments argument1 and argument2 respectively.



## CircuitS (String) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr CircuitS(int32_t Parameter, CStr Argument);
```

This interface returns a string according to the number sent in the variable "parameter". The parameter can be one of the following:

*Parameter 0: Circuit.Name*

This parameter returns the name of the active circuit.

*Parameter 1: Circuit.Disable*

This parameter allows to disable an element of the active circuit, the element must be specified by name. As a result, this parameter will deliver the string "Ok".

*Parameter 2: Circuit.Enable*

This parameter allows to enable an element of the active circuit, the element must be specified by name. As a result, this parameter will deliver the string "Ok".

*Parameter 3: Circuit.SetActiveElement*

This parameter allows to activate an element of the active circuit, the element must be specified by name. As a result, this parameter will deliver a string with the index of the active element.

*Parameter 4: Circuit.SetActiveBus*

This parameter allows to activate a bus of the active circuit, the bus must be specified by name. As a result, this parameter will deliver a string with the index of the active Bus.

*Parameter 5: Circuit.SetActiveClass*

This parameter allows to activate a Class of the active circuit, the Class must be specified by name. As a result, this parameter will deliver a string with the index of the active Class.

## CircuitV (Variant) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void CircuitV(int32_t Parameter, VARIANT *Argument, int32_t Argument2);
```

This interface returns a variant according to the number sent in the variable "parameter". The parameter can be one of the following:

*Parameter 0: Circuit.Losses*

This parameter returns an array of doubles (two doubles for representing a complex number) with the total losses of the active circuit. Argument2 must be 0.

*Parameter 1: Circuit.LineLosses*

This parameter returns an array of doubles (two doubles for representing a complex number) with the total Line losses of the active circuit. Argument2 must be 0.

*Parameter 2: Circuit.SubstationLosses*

This parameter returns an array of doubles (two doubles for representing a complex number) with the total transformer losses of the active circuit. Argument2 must be 0.

*Parameter 3: Circuit.TotalPower*

This parameter returns an array of doubles (two doubles for representing a complex number) with the total power in watts delivered to the active circuit. Argument2 must be 0.

*Parameter 4: Circuit.AllBusVolts*

This parameter returns an array of doubles (two doubles for representing a complex number) with the node voltages from the most recent solution. Argument2 must be 0.

*Parameter 5: Circuit.AllBusVMag*

This parameter returns an array of doubles (magnitude and angle) with the node voltages from the most recent solution. Argument2 must be 0.

*Parameter 6: Circuit.AllElementNames*

This parameter returns an array of strings with the names of all the elements of the active circuit. Argument2 must be 0.

*Parameter 7: Circuit.AllBusNames*

This parameter returns an array of strings with the names of all the Buses of the active circuit (See AllNodeNames). Argument2 must be 0.

*Parameter 8: Circuit.AllElementLosses*

This parameter returns an array of doubles (two doubles for representing a complex number) with the losses in each element of the active circuit. Argument2 must be 0.

*Parameter 9: Circuit.AllBusVMagPu*

This parameter returns an array of doubles with the voltages in per unit of the most recent solution of the active circuit. Argument2 must be 0.

*Parameter 10: Circuit.AllNodeNames*

This parameter returns an array of strings containing full name of each node in system in same order as returned by AllBusVolts, etc. Argument2 must be 0.

*Parameter 11: Circuit.SystemY*

This parameter returns an array of doubles (two doubles for representing a complex number) containing the Y Bus Matrix of the system (after a solution has been performed). Argument2 must be 0.

*Parameter 12: Circuit.AllBusDistances*

This parameter returns distance from each bus to parent EnergyMeter. Corresponds to sequence in AllBusNames. Argument2 must be 0.

*Parameter 13: Circuit.AllNodeDistances*

This parameter returns distance from each Node to parent EnergyMeter. Corresponds to sequence in AllBusVmag. Argument2 must be 0.

*Parameter 14: Circuit.AllNodeVMagbyPhase*

This parameter returns array of doubles representing the voltage magnitudes for nodes on the specified phase. The phase must be specified in the Argument2.

*Parameter 15: Circuit.AllNodeVMagPUByPhase*

This parameter returns array of doubles representing the voltage magnitudes (in per unit) for nodes on the specified phase. The phase must be specified in the Argument2.

*Parameter 16: Circuit.AllNodeDistancesByPhase*

This parameter returns array of doubles representing the distances to parent EnergyMeter. Sequence of array corresponds to other node ByPhase properties. Argument2 must contain the number of the phase to return.

*Parameter 17: Circuit.AllNodeNamesByPhase*

This parameter returns array of strings of the node names for the By Phase criteria. Sequence corresponds to other ByPhase properties. Argument2 must contain the number of the phase to return.

*Parameter 18: Circuit.YNodeVArray*

This parameter returns a complex array of actual node voltages in same order as SystemY Matrix. Argument2 must be 0.

*Parameter 19: Circuit.YNodeOrder*

This parameter returns a variant array of strings containing the names of the nodes in the same order as the Y Matrix. Argument2 must be 0.

*Parameter 20: Circuit.YCurrents*

This parameter returns a returns a variant array of doubles containing complex injection currents for the present solution. It is the "I" vector of  $I=YV$ . Argument2 must be 0.

## Bus Interface

This interface implements the Bus (IBus) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### BusI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

`int32_t BUSI(int32_t Parameter, int32_t Argument);`

This interface returns an integer according to the number sent in the variable "parameter". The parameter can be one of the following:

*Parameter 0: Bus.NumNodes*

This parameter returns the number of nodes of this bus.

*Parameter 1: Bus.ZscRefresh*

This parameter recomputes Zsc for active bus for present circuit configuration. Return 1 if the procedure was successful.

*Parameter 2: Bus.Coorddefined*

This parameter returns 1 if a coordinate has been defined for this bus; otherwise, it will return 0.

*Parameter 3: Bus.GetUniqueNodeNumber*

This parameter returns a unique node number at the active bus to avoid node collisions and adds it to the node list for the bus. The start number can be specified in the argument.

*Parameter 4: Bus.N\_Customers*

This parameter returns the total number of customers server down line from this bus.

*Parameter 5: Bus.SectionID*

This parameter returns the integer ID of the feeder section in which this bus is located.

## **BusF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double BUSF(int32_t Parameter, double Argument);
```

This interface returns a floating point number (64 bits) according to the number sent in the variable "parameter". The parameter can be one of the following:

*Parameter 0: Bus.kVBase*

This parameter returns the base voltage at bus in kV.

*Parameter 1: Bus.X - read*

This parameter returns the X coordinate for the bus.

*Parameter 2: Bus.X - Write*

This parameter allows to write the X coordinate for the bus. Returns 0.

*Parameter 3: Bus.Y - read*

This parameter returns the Y coordinate for the bus.

*Parameter 4: Bus.Y - Write*

This parameter allows to write the Y coordinate for the bus. Returns 0.

*Parameter 5: Bus.Distance*

This parameter returns the distance from the energymeter (if non-zero).

*Parameter 6: Bus.Lambda*

This parameter returns the accumulated failure rate downstream from this bus; faults per year.

*Parameter 7: Bus.N\_Interrupts*

This parameter returns the number of interruptions this bus per year.

*Parameter 8: Bus.Int\_Duration*

This parameter returns the average interruption duration in hours.

*Parameter 9: Bus.Cust\_interrupts*

This parameter returns the annual number of customer interruptions from this bus.

*Parameter 10: Bus.Cust\_duration*

This parameter returns the accumulated customer outage durations.

*Parameter 11: Bus.Totalmiles*

This parameter returns the total length of line downline from this bus, in miles. For recloser siting algorithm.

## **BusS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr BUSS(int32_t Parameter, CStr Argument);
```

This interface returns a string according to the number sent in the variable “parameter”. The parameter can be one of the following:

*Parameter 0: Bus.Name*

This parameter returns the name of the active bus.

## **BusV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void BUSV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a variant according to the number sent in the variable “parameter”. The parameter can be one of the following:

*Parameter 0: Bus.Voltages*

This parameter returns a complex array of voltages at this bus.

*Parameter 1: Bus.SeqVoltages*

This parameter returns a complex array of Sequence voltages at this bus.

*Parameter 2: Bus.Nodes*

This parameter returns an integer array of node numbers defined at the bus in same order as the voltages.

*Parameter 3: Bus.Voc*

This parameter returns the open circuit voltage as complex array.

*Parameter 4: Bus.Isc*

This parameter returns the short circuit current as complex array.

*Parameter 5: Bus.PuVoltages*

This parameter returns the voltages in per unit at bus as complex array.

*Parameter 6: Bus.ZscMatrix*

This parameter returns the complex array of Zsc matrix at bus, column by column.

*Parameter 7: Bus.Zsc1*

This parameter returns the complex positive-sequence short circuit impedance at bus.

*Parameter 8: Bus.Zsc0*

This parameter returns the complex zero-sequence short circuit impedance at bus.

*Parameter 9: Bus.YscMatrix*

This parameter returns the complex array of Ysc matrix at bus, column by column.

*Parameter 10: Bus.CplxSeqVoltages*

This parameter returns the complex double array of sequence voltages (0, 1, 2) at this bus.

*Parameter 11: Bus.VLL*

This parameter for 2 and 3 phase buses, returns a variant array of complex numbers representing L-L voltages in volts. Returns -1.0 for 1-phase bus. If more than 3 phases, returns only first 3.

*Parameter 12: Bus.PuVLL*

This parameter for 2 and 3 phase buses, returns a variant array of complex numbers representing L-L voltages in per unit. Returns -1.0 for 1-phase bus. If more than 3 phases, returns only first 3.

*Parameter 13: Bus.VMagAngle*

This parameter returns a variant array of doubles containing voltages in magnitude (VLN), angle (deg).

*Parameter 14: Bus.PuVMagAngle*

This parameter returns a variant array of doubles containing voltages in per unit and angles in degrees.

## Solution Interface

This interface implements the Solution (ISolution) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### SolutionI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t SolutionI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer according to the number sent in the variable "parameter". The parameter can be one of the following:

*Parameter 0: Solution.Solve*

Executes the solution for the present solution mode. Returns 0.

*Parameter 1: Solution.Mode - Read*

This parameter returns the present solution mode (See DSS help).

*Parameter 2: Solution.Mode - Write*

This parameter modifies the present solution mode (See DSS help).

*Parameter 3: Solution.hour - Read*

This parameter returns the present hour (See DSS help).

*Parameter 4: Solution.hour - Write*

This parameter modifies the present hour (See DSS help).

*Parameter 5: Solution.Year - Read*

This parameter returns the present Year (See DSS help).

*Parameter 6: Solution.Year - Write*

This parameter modifies the present Year (See DSS help).

*Parameter 7: Solution.Iterations*

This parameter return the number of iterations taken for the last solution.

*Parameter 8: Solution.MaxIterations - Read*

This parameter returns the Maximum number of iterations used to solve the circuit.

*Parameter 9: Solution.MaxIterations - Write*

This parameter modifies the Maximum number of iterations used to solve the circuit.

*Parameter 10: Solution.Number - Read*

This parameter returns the number of solutions to perform for MonteCarlo and time series simulations.

*Parameter 11: Solution.Number - Write*

This parameter modifies the number of solutions to perform for MonteCarlo and time series simulations.

*Parameter 12: Solution.Random - Read*

This parameter returns the randomization mode for random variables "Gaussian" o "Uniform".

*Parameter 13: Solution.Random - Write*

This parameter modifies the randomization mode for random variables "Gaussian" o "Uniform".

*Parameter 14: Solution.LoadModel - Read*

This parameter returns the Load Model: {dssPowerFlow (default)|dssAdmittance}.

*Parameter 15: Solution.LoadModel - Write*

This parameter modifies the Load Model: {dssPowerFlow (default)|dssAdmittance}.

*Parameter 16: Solution.AddType - Read*

This parameter returns the type of device to add in AutoAdd Mode: {dssGen (default)|dssCap}.

*Parameter 17: Solution.AddType - Write*

This parameter modifies the type of device to add in AutoAdd Mode: {dssGen (default)|dssCap}.

*Parameter 18: Solution.Algorithm - Read*

This parameter returns the base solution algorithm: {dssNormalSolve | dssNewtonSolve}.

*Parameter 19: Solution.Algorithm - Write*

This parameter modifies the base solution algorithm: {dssNormalSolve | dssNewtonSolve}.

*Parameter 20: Solution.ControlMode - Read*

This parameter returns the mode for control devices: {dssStatic (default) | dssEvent | dssTime}.

*Parameter 21: Solution.ControlMode - Write*

This parameter modifies the mode for control devices: {dssStatic (default) | dssEvent | dssTime}.

*Parameter 22: Solution.ControlIterations - Read*

This parameter returns the current value of the control iteration counter.

*Parameter 23: Solution.ControlIterations - Write*

This parameter modifies the current value of the control iteration counter.

*Parameter 24: Solution.MaxControlIterations - Read*

This parameter returns the maximum allowable control iterations.

*Parameter 25: Solution.MaxControlIterations - Write*

This parameter modifies the maximum allowable control iterations.

*Parameter 26: Solution.Sample\_DoControlActions*

This parameter sample controls and then process the control queue for present control mode and dispatch control actions. Returns 0.

*Parameter 27: Solution.CheckFaultStatus*

This parameter executes status check on all fault objects defined in the circuit. Returns 0.

*Parameter 28: Solution.SolveDirect*

This parameter executes a direct solution from the system Y matrix, ignoring compensation currents of loads, generators (includes Yprim only).

*Parameter 29: Solution.SolvePflow*

This parameter solves using present power flow method. Iterative solution rather than direct solution.

*Parameter 30: Solution.SolveNoControl*

This parameter is similar to SolveSnap except no control actions are checked or executed.

*Parameter 31: Solution.SolvePlusControl*

This parameter executes a power flow solution (SolveNoControl) plus executes a CheckControlActions that executes any pending control actions.

*Parameter 32: Solution.InitSnap*

This parameter initializes some variables for snap shot power flow. SolveSnap does this automatically.

*Parameter 33: Solution.CheckControls*

This parameter performs the normal process for sampling and executing Control Actions and Fault Status and rebuilds Y if necessary.

*Parameter 34: Solution.SampleControlDevices*

This parameter executes a sampling of all intrinsic control devices, which push control actions into the control queue.

*Parameter 35: Solution.DoControlActions*

This parameter pops control actions off the control queue and dispatches to the proper control element.

*Parameter 36: Solution.BuildYMatrix*

This parameter forces building of the System Y matrix according to the argument: {1= series elements only | 2= Whole Y matrix}.

*Parameter 37: Solution.SystemYChanged*

This parameter indicates if elements of the System Y have been changed by recent activity. If changed returns 1; otherwise 0.

*Parameter 38: Solution.Converged - Read*

This parameter indicates whether the circuit solution converged (1 converged | 0 not converged).

*Parameter 39: Solution.Converged - Write*

This parameter modifies the converged flag (1 converged | 0 not converged).

*Parameter 40: Solution.TotalIterations*

This parameter returns the total iterations including control iterations for most recent solution.

*Parameter 41: Solution.MostIterationsDone*

This parameter returns the max number of iterations required to converge at any control iteration of the most recent solution.

*Parameter 42: Solution.ControlActionsDone - Read*

This parameter indicates that the control actions are done: {1 done, 0 not done}.



*Parameter 43: Solution.ControlActionsDone - Write*

This parameter modifies the flag to indicate that the control actions are done: {1 done, 0 not done}.

*Parameter 44: Solution.FinishTimeStep*

This parameter call cleanup, sample monitors, and increment time at end of time step.

*Parameter 45: Solution.Cleanup*

This parameter update storage, invcontrol, etc., at end of time step.

## **SolutionF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double SolutionF(int32_t Parameter, double Argument);
```

This interface returns a floating point number according to the number sent in the variable "parameter". The parameter can be one of the following:

*Parameter 0: Solution.Frequency read*

This parameter returns the frequency for the next solution.

*Parameter 1: Solution.Frequency Write*

This parameter sets the frequency for the next solution.

*Parameter 2: Solution.Seconds read*

This parameter returns the seconds from top of the hour.

*Parameter 3: Solution.Seconds Write*

This parameter sets the seconds from top of the hour.

*Parameter 4: Solution.StepSize read*

This parameter returns the step size for the next solution.

*Parameter 5: Solution.StepSize Write*

This parameter sets the step size for the next solution.

*Parameter 6: Solution.LoadMult read*

This parameter returns the default load multiplier applied to all non-fixed loads.

*Parameter 7: Solution.LoadMult Write*

This parameter sets the default load multiplier applied to all non-fixed loads.

*Parameter 8: Solution.Tolerance read*

This parameter returns the solution convergence tolerance.

*Parameter 9: Solution.Tolerance Write*

This parameter sets the solution convergence tolerance.

*Parameter 10: Solution.pctgrowth read*

This parameter returns the percent default annual load growth rate.

*Parameter 11: Solution.pctgrowth Write*

This parameter sets the percent default annual load growth rate.

*Parameter 12: Solution.GenkW read*

This parameter returns the generator kW for AutoAdd mode.

*Parameter 13: Solution.GenkW Write*

This parameter sets the generator kW for AutoAdd mode.

*Parameter 14: Solution.GenPF read*

This parameter returns the pf for generators in AutoAdd mode.

*Parameter 15: Solution.GenPF Write*

This parameter sets the pf for generators in AutoAdd mode.

*Parameter 16: Solution.Capkvar read*

This parameter returns the capacitor kvar for adding in AutoAdd mode.

*Parameter 17: Solution.Capkvar Write*

This parameter sets the capacitor kvar for adding in AutoAdd mode.

*Parameter 18: Solution.GenMult read*

This parameter returns the default multiplier applied to generators (like LoadMult).

*Parameter 19: Solution.GenMult Write*

This parameter sets the default multiplier applied to generators (like LoadMult).

*Parameter 20: Solution.dblHour read*

This parameter returns the hour as a double, including fractional part.

*Parameter 21: Solution.dblHour Write*

This parameter sets the hour as a double, including fractional part.

*Parameter 22: Solution.StepSizeMin*

This parameter sets the step size in minutes.

*Parameter 23: Solution.StepSizeHr*

This parameter sets the step size in Hours.

*Parameter 24: Solution.Process\_Time*

This parameter retrieves the time required (microseconds) to perform the latest solution time step, this time does not includes the time required for sampling meters/monitors.

*Parameter 25: Solution.Total\_Time read*

This parameter retrieves the accumulated time required (microseconds) to perform the simulation.

*Parameter 26: Solution.Total\_Time Write*

This parameter sets the accumulated time (microseconds) register. The new value for this register must be specified in the argument.

*Parameter 27: Solution.Time\_TimeStep*

This parameter retrieves the time required (microseconds) to perform the latest solution time step including the time required for sampling meters/monitors.

## **SolutionS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr SolutionS(int32_t Parameter, CStr Argument);
```

This interface returns a string according to the number sent in the variable “parameter”. The parameter can be one of the following:

*Parameter 0: Solution.ModelID*

This parameter returns the ID (text) of the present solution mode.

*Parameter 1: Solution.LDCurve read*

This parameter returns the Load-Duration Curve name for LD modes.

*Parameter 2: Solution.LDCurve write*

This parameter sets the Load-Duration Curve name for LD modes.

*Parameter 3: Solution.DefaultDaily read*

This parameter returns the default daily load shape (defaults to "Default").

*Parameter 4: Solution.DefaultDaily write*

This parameter sets the default daily load shape (defaults to "Default").

*Parameter 5: Solution.DefaultYearly read*

This parameter returns the default yearly load shape (defaults to "Default").

*Parameter 6: Solution.DefaultYearly write*

This parameter sets the default yearly load shape (defaults to "Default").

## **SolutionV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void SolutionV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a variant according to the number sent in the variable “parameter”. The parameter can be one of the following:

*Parameter 0: Solution.EventLog*

This parameter returns an array of strings containing the Event Log.

## **Monitors Interface**

This interface implements the Monitors (IMonitors) interface of OpenDSS by declaring 3 procedures for accessing the different properties included in this interface.

## **MonitorsI (Int) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t MonitorsI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer according to the number sent in the variable “parameter”. The parameter can be one of the following:

*Parameter 0: Monitors.First*

This parameter sets the first monitor active. Returns 0 if no monitors.

*Parameter 1: Monitors.Next*

This parameter set the next monitor active. Returns 0 if no more.

*Parameter 2: Monitors.Reset*

This parameter resets the active Monitor object.

*Parameter 3: Monitors.ResetAll*

This parameter resets all Monitor object.

*Parameter 4: Monitors.Sample*

This parameter causes active monitor to take a sample.

*Parameter 5: Monitors.Save*

This parameter causes active monitor to save its current sample buffer to its monitor stream. Then you can access the Bytestream or channel data. Most standard solution modes do this automatically.

*Parameter 6: Monitors.Show*

This parameter converts monitor file into text and displays with text editor.

*Parameter 7: Monitors.Mode read*

This parameter returns the monitor mode (bitmask integer - see DSS Help).

*Parameter 8: Monitors.Mode write*

This parameter sets the monitor mode (bitmask integer - see DSS Help).

*Parameter 9: Monitors.SampleCount*

This parameter returns number of samples in Monitor at present.

*Parameter 10: Monitors.SampleAll*

This parameter causes all Monitors to take a sample of the present state. Returns 0.

*Parameter 11: Monitors.SaveAll*

This parameter save all Monitor buffers to their respective file streams. Returns 0.

*Parameter 12: Monitors.Count*

This parameter returns the number of monitors.

*Parameter 13: Monitors.Process*

This parameter post-process monitor samples taken so far, e.g., Pst for mode = 4.

*Parameter 14: Monitors.ProcessAll*

This parameter makes that all monitors post-process the data taken so far.

*Parameter 15: Monitors.FileVersion*

This parameter returns the Monitor File version (integer).

*Parameter 16: Monitors.RecordSize*

This parameter returns the size of each record in ByteStream.

*Parameter 17: Monitors.NumChannels*

This parameter returns the number of Channels on the active Monitor.

*Parameter 18: Monitors.Terminal read*

This parameter returns the terminal number of element being monitored.

*Parameter 19: Monitors.Terminal Write*

This parameter sets the terminal number of element being monitored.

## **MonitorsS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr MonitorsS(int32_t Parameter, CStr Argument);
```

This interface returns a string according to the number sent in the variable "parameter". The parameter can be one of the following:

*Parameter 0: Monitors.FileName*

This parameter returns the name of the CSV file associated with active monitor.

*Parameter 1: Monitors.Name read*

This parameter returns the active Monitor object by name.

*Parameter 2: Monitors.Name Write*

This parameter sets the active Monitor object by name.

*Parameter 3: Monitors.Element read*

This parameter return the full name of element being monitored by the active Monitor.

*Parameter 4: Monitors.Element Write*

This parameter sets the full name of element being monitored by the active Monitor.

## **MonitorsV (variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void MonitorsV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a variant according to the number sent in the variable "parameter". The parameter can be one of the following:

*Parameter 0: Monitors.AllNames*

This parameter returns an array of all Monitor names (array of strings).

*Parameter 1: Monitors.ByteStream*

This parameter returns a byte array containing monitor stream values. Make sure a "save" is done first (standard solution modes do this automatically).

*Parameter 2: Monitors.Header*

This parameter returns the header string; Variant array of strings containing Channel Names.

*Parameter 3: Monitors.dblHour*

This parameter returns a variant array of doubles containing time value in hours for the time-sampled monitor values; empty if frequency-sampled values for harmonics solution (see dblFreq).

*Parameter 4: Monitors.dblFreq*

This parameter returns a variant array of doubles containing time values for harmonics mode solutions; empty for time mode solutions (use dblHour).

*Parameter 5: Monitors.Channel*

This parameter returns a variant array of doubles for the specified channel (usage: MyArray = DSSmonitor.Channel(i)) A save or SaveAll should be executed first. Done automatically by most standard solution modes.

## Meters Interface

This interface implements the Meters (IMeters) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### MetersI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t MetersI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer according to the number sent in the variable “parameter”. The parameter can be one of the following:

*Parameter 0: Meters.First*

This parameter sets the first Energy Meter active. Returns 0 if no monitors.

*Parameter 1: Meters.Next*

This parameter sets the next energy Meter Active. Returns 0 if no more.

*Parameter 2: Meters.Reset*

This parameter resets the active Meter object.

*Parameter 3: Meters.ResetAll*

This parameter resets all Meter object.

*Parameter 4: Meters.Sample*

This parameter causes active meter to take a sample.

*Parameter 5: Meters.Save*

This parameter causes active meter to save its current sample buffer to its meter stream. Then you can access the Bytestream or channel data. Most standard solution modes do this automatically.

*Parameter 6: Meters.MeteredTerminal read*

This parameter returns the number of metered terminal by the active Energy Meter.

*Parameter 7: Meters.MeterdTerminal Write*

This parameter sets the number of metered terminal by the active Energy Meter.

*Parameter 8: Meters.DIFilesAreopen*

This parameter returns a global flag (1=true, 0=false) to indicate if Demand Interval (DI) files have been properly opened.

*Parameter 9: Meters.SampleAll*

This parameter causes all Energy Meters to take a sample of the present state. Returns 0.

*Parameter 10: Meters.SaveAll*

This parameter save all Energy Meter buffers to their respective file streams. Returns 0.

*Parameter 11: Meters.OpenAllDIFiles*

This parameter opens Demand Interval (DI) files. Returns 0.

*Parameter 12: Meters.CloseAllDIFiles*

This parameter close all Demand Interval (DI) files. Necessary at the end of a run.

*Parameter 13: Meters.CountEndElement*

This parameter returns the number of zone end elements in the active meter zone.

*Parameter 14: Meters.Count*

This parameter returns the number of Energy Meters in the Active Circuit.

*Parameter 15: Meters.CountBranches*

This parameter returns the number of branches in active Energy Meter zone (same as sequencelist size).

*Parameter 16: Meters.SequenceIndex read*

This parameter returns the index into meter's SequenceList that contains branch pointers in lexical order. Earlier index guaranteed to be up line from later index. Sets PDElement active.

*Parameter 17: Meters.SequenceIndex Write*

This parameter sets the index into meter's SequenceList that contains branch pointers in lexical order. Earlier index guaranteed to be up line from later index. Sets PDElement active.

*Parameter 18: Meters.DoReliabilityCalc*

This parameter calculates SAIFI, etc. if the Argument is equal to 1 this parameter will assume restoration, otherwise it will not.

*Parameter 19: Meters.SeqListSize*

This parameter returns the size of Sequence List.

*Parameter 20: Meters.TotalCustomers*

This parameter returns the total number of customers in this zone (down line from the Energy Meter).

*Parameter 21: Meters.NumSections*

This parameter returns the number of feeder sections in this meter's zone.

*Parameter 22: Meters.SetActiveSection*

This parameter sets the designated section (argument) if the index is valid.

*Parameter 23: Meters.OCPDeviceType*

This parameter returns the type of OCP device: {1=fuse | 2+ recloser | 3= relay}.

*Parameter 24: Meters.NumSectionCustomers*

This parameter returns the number of customers in the active section.

*Parameter 25: Meters.NumSectionBranches*

This parameter returns the number of branches (lines) in the active section.

*Parameter 26: Meters.SectSeqIdx*

This parameter returns the Sequence Index of the branch at the head of this section.

*Parameter 27: Meters.SectTotalCust*

This parameter returns the total customers down line from this section.

## MetersF (Float) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double MetersF(int32_t Parameter, double Argument);
```

This interface returns a floating point number (64 bits) according to the number sent in the variable "parameter". The parameter can be one of the following:

*Parameter 0: Meters.SAIFI*

This parameter returns SAIFI for this meter's zone. Execute reliability calc method first.

*Parameter 1: Meters.SAIFkW*

This parameter returns the SAIFI based on kW rather than number of customers. Get after reliability calcs.

*Parameter 2: Meters.SAIDI*

This parameter returns the SAIDI for this meter zone. Execute DoreliabilityCalc first.

*Parameter 3: Meters.CustInterrupts*

This parameter returns the total customer interruptions for this meter zone based on reliability calcs.

*Parameter 4: Meters.AvgRepairTime*

This parameter returns the average Repair Time in this Section of the meter zone.

*Parameter 5: Meters.FaultRateXRepairHrs*

This parameter returns the sum of Fault Rate time Repair Hours in this section of the meter zone.

*Parameter 6: Meters.SumBranchFltRates*

This parameter returns the sum of the branch fault rates in this section of the meter's zone.

## MetersS (String) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr MetersS(int32_t Parameter, CStr Argument);
```

This interface returns a string according to the number sent in the variable "parameter". The parameter can be one of the following:

*Parameter 0: Meters.Name read*

This parameter returns the active Energy Meter's name.

*Parameter 1: Meters.Name Write*

This parameter sets the active Energy Meter's name.

*Parameter 2: Meters.MeteredElement read*

This parameter returns the name of the metered element (considering the active Energy Meter).

*Parameter 3: Meters.MeteredElement Write*

This parameter sets the name of the metered element (considering the active Energy Meter).



## MetersV (Variant) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void MetersV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a variant according to the number sent in the variable "parameter". The parameter can be one of the following:

*Parameter 0: Meters.AllNames*

This parameter returns an array of all Energy Meter names.

*Parameter 1: Meters.RegisterNames*

This parameter returns an array of strings containing the names of the registers.

*Parameter 2: Meters.RegisterValues*

This parameter returns an array of values contained in the Meter registers for the active Meter.

*Parameter 3: Meters.Totals*

This parameter returns the totals for all registers of all Meters.

*Parameter 4: Meters.PeakCurrent read*

This parameter returns an array of doubles with the Peak Current Property.

*Parameter 5: Meters.PeakCurrent Write*

This parameter receives an array of doubles to set values of Peak Current Property.

*Parameter 6: Meters.CalcCurrent read*

This parameter returns the magnitude of the real part of the Calculated Current (normally determined by solution) for the meter to force some behavior on Load Allocation.

*Parameter 7: Meters.CalcCurrent Write*

This parameter sets the magnitude of the real part of the Calculated Current (normally determined by solution) for the meter to force some behavior on Load Allocation.

*Parameter 8: Meters.AllocFactors read*

This parameter returns an array of doubles: allocation factors for the active Meter.

*Parameter 9: Meters.AllocFactors Write*

This parameter receives an array of doubles to set the phase allocation factors for the active Meter.

*Parameter 10: Meters.AllEndElements*

This parameter returns a variant array of names of all zone end elements.

*Parameter 11: Meters.AllBranchesInZone*

This parameter returns a wide string list of all branches in zone of the active Energy Meter object.

## Generators Interface

This interface implements the Generators (IGenerators) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

## GeneratorsI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t GeneratorsI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Generators.First*

This parameter sets first generator to be active. Returns 0 if None.

*Parameter 1: Generators.Next*

This parameter sets next generator to be active. Returns 0 if None.

*Parameter 2: Generators.ForcedON read*

This parameter returns 1 if the generator is forced ON regardless of other dispatch criteria; otherwise, returns 0.

*Parameter 3: Generators.ForcedON Write*

This parameter allows to force ON regardless of other dispatch criteria. To force ON put 1 in the argument, otherwise put 0.

*Parameter 4: Generators.Phases read*

This parameter returns the number of phases of the active generator.

*Parameter 5: Generators.Phases Write*

This parameter sets the number of phases (argument) of the active generator.

*Parameter 6: Generators.Count*

This parameter returns the number of generators Objects in Active Circuit.

*Parameter 7: Generators.Idx read*

This parameter gets the active generator by Index into generators list. 1..Count.

*Parameter 8: Generators.Idx Write*

This parameter sets the active generator (argument) by Index into generators list. 1..Count.

*Parameter 9: Generators.Model read*

This parameter gets the active generator Model (see Manual for details).

*Parameter 10: Generators.Model Write*

This parameter sets the active generator Model (see Manual for details).

## **GeneratorsF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double GeneratorsF(int32_t Parameter, double Argument);
```

This interface returns a floating point number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Generators.kV read*

This parameter gets the voltage base for the active generator, kV.

*Parameter 1: Generators.kV Write*

This parameter sets the voltage base for the active generator, kV.

*Parameter 2: Generators.kW read*

This parameter gets the kW output for the active generator, kvar is updated for current power factor.

*Parameter 3: Generators.kW Write*

This parameter sets the kW output for the active generator, kvar is updated for current power factor.

*Parameter 4: Generators.kvar read*

This parameter gets the kvar output for the active generator, kW is updated for current power factor.

*Parameter 5: Generators.kvar Write*

This parameter sets the kvar output for the active generator, kW is updated for current power factor.

*Parameter 6: Generators.Pf read*

This parameter gets the power factor (pos. = producing vars). Updates kvar based on present kW value.

*Parameter 7: Generators.Pf Write*

This parameter sets the power factor (pos. = producing vars). Updates kvar based on present kW value.

*Parameter 8: Generators.KVARated read*

This parameter gets the KVA rating of the generator.

*Parameter 9: Generators.KVARated Write*

This parameter sets the KVA rating of the generator.

*Parameter 10: Generators.Vmaxpu read*

This parameter gets the Vmaxpu for Generator Model.

*Parameter 11: Generators.VMaxpu Write*

This parameter sets the Vmaxpu for Generator Model.

*Parameter 12: Generators.Vminpu read*

This parameter gets the Vminpu for Generator Model.

*Parameter 13: Generators.VMinpu Write*

This parameter sets the Vminpu for Generator Model.

## **GeneratorsS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr GeneratorsS(int32_t Parameter, CStr Argument);
```

This interface returns a string as a result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Generators.Name read*

This parameter returns the active generator's name.

*Parameter 1: Generators.Name Write*

This parameter sets the active generator's name.

## **GeneratorsV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void GeneratorsV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant as a result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Generators.AllNames*

This parameter gets the array of names of all Generator objects.

*Parameter 1: Generators.RegisterNames*

This parameter gets the array of names of all generator Energy Meter registers.

*Parameter 2: Generators.RegisterValues*

This parameter gets the array of values in generator Energy Meter registers.

## **DSSProgress Interface**

This interface implements the DSSProgress (IDSSProgress) interface of OpenDSS by declaring 2 procedures for accessing the different properties included in this interface.

## **DSSProgressI (Int) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t DSSProgressI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: DSSProgress.PctProgress*

This parameter sets the percent progress to indicate [0..100].

*Parameter 1: DSSProgress.Show*

This parameter shows progress form with null caption and progress set to zero.

*Parameter 2: DSSProgress.Close*

This parameter closes (hides) DSS Progress form.

## **DSSProgressS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr DSSProgressS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable *Parameter*, which can be one of the following:

*Parameter 0: DSSProgress.Caption*

This parameter sets the caption to appear on the bottom of the DSS Progress form.

## Settings Interface

This interface implements the Settings (ISettings) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

## SettingsI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t SettingsI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable *Parameter*, which can be one of the following:

*Parameter 0: Settings.AllowDuplicates read*

This parameter gets if OpenDSS allows duplicate names of objects: {1 allow, 0 not allow}.

*Parameter 1: Settings.AllowDuplicates Write*

This parameter sets if OpenDSS allows duplicate names of objects: {1 allow, 0 not allow}.

*Parameter 2: Settings.ZoneLock read*

This parameter gets the status of Lock zones on energy meters to prevent rebuilding if a circuit change occurs: {1= true, 0= False}.

*Parameter 3: Settings.ZoneLock Write*

This parameter sets the status of Lock zones on energy meters to prevent rebuilding if a circuit change occurs: {1= true, 0= False}.

*Parameter 4: Settings.CktModel read*

This parameter gets {dssMultiphase\* | dssPositiveSeq} Indicate if the circuit model is positive sequence.

*Parameter 5: Settings.CktModel Write*

This parameter sets {dssMultiphase\* | dssPositiveSeq} Indicate if the circuit model is positive sequence.

*Parameter 6: Settings.Trapezoidal read*

This parameter gets {True (1) | False (0)} value of trapezoidal integration flag in Energy Meters.

*Parameter 7: Settings.Trapezoidal Write*

This parameter sets {True (1) | False (0)} value of trapezoidal integration flag in Energy Meters.

## **SettingsF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double SettingsF(int32_t Parameter, double Argument);
```

This interface returns a floating point number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Settings.AllocationFactors*

This parameter sets all load allocation factors for all loads defined by XFKVA property to this value.

*Parameter 1: Settings.NormVminpu read*

This parameter gets the per unit minimum voltage for Normal conditions.

*Parameter 2: Settings.NormVminpu write*

This parameter sets the per unit minimum voltage for Normal conditions.

*Parameter 3: Settings.NormVmaxpu read*

This parameter gets the per unit maximum voltage for Normal conditions.

*Parameter 4: Settings.NormVmaxpu write*

This parameter sets the per unit maximum voltage for Normal conditions.

*Parameter 5: Settings.EmergVminpu read*

This parameter gets the per unit minimum voltage for Emergency conditions.

*Parameter 6: Settings.EmergVminpu write*

This parameter set the per unit minimum voltage for Emergency conditions.

*Parameter 7: Settings.EmergVmaxpu read*

This parameter gets the per unit maximum voltage for Emergency conditions.

*Parameter 8: Settings.EmergVmaxpu write*

This parameter sets the per unit maximum voltage for Emergency conditions.

*Parameter 9: Settings.UEWeight read*

This parameter gets the weighting factor applied to UE register values.

*Parameter 10: Settings.UEWeight write*

This parameter sets the weighting factor applied to UE register values.

*Parameter 11: Settings.LossWeight read*

This parameter gets the weighting factor applied to Loss register values.

*Parameter 12: Settings.LossWeight write*

This parameter sets the weighting factor applied to Loss register values.

*Parameter 13: Settings.PriceSignal read*

This parameter gets the price signal for the circuit.

*Parameter 14: Settings.PriceSignal write*

This parameter sets the price signal for the circuit.

## SettingsS (String) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr SettingsS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Settings.AutoBusList read*

This parameter gets the list of Buses or (File=xxxxx) syntax for the AutoAdd solution mode.

*Parameter 1: Settings.AutoBusList write*

This parameter sets the list of Buses or (File=xxxxx) syntax for the AutoAdd solution mode.

*Parameter 2: Settings.PriceCurve read*

This parameter gets the name of LoadShape object that serves as the source of price signal data for yearly simulations, etc.

*Parameter 3: Settings.PriceCurve write*

This parameter sets the name of LoadShape object that serves as the source of price signal data for yearly simulations, etc.

## SettingsV (Variant) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void SettingsV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Settings.UERegs read*

This parameter gets the array of Integers defining Energy Meter registers to use for computing UE.

*Parameter 1: Settings.UERegs write*

This parameter sets the array of Integers defining Energy Meter registers to use for computing UE.

*Parameter 2: Settings.LossRegs read*

This parameter gets the array of Integers defining Energy Meter registers to use for computing Losses.

*Parameter 3: Settings.LossRegs write*

This parameter sets the array of Integers defining Energy Meter registers to use for computing Losses.

*Parameter 4: Settings.VoltageBases read*

This parameter gets the array of doubles defining the legal voltage bases in kV L-L.

*Parameter 5: Settings.VoltageBases write*

This parameter sets the array of doubles defining the legal voltage bases in kV L-L.

## Loads Interface

This interface implements the Loads (ILoads) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### Loads Int (Integers) Interface

This interface can be used to read/modify the properties of the Loads Class where the values are integers. The structure of the interface is as follows:

```
int32_t DSSLoads(int32_t Parameter, int32_t argument)
```

This interface returns an integer (signed 32 bits), the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Loads.First*

This parameter allows to set the active load into the first load registered in the active circuit. As a result, this property will return the number 1. The parameter argument can be filled with a 0.

*Parameter 1: Loads.Next*

This parameter sets the active load into the next load registered in the active circuit. As a result, this property will deliver the index of the active load. The parameter argument can be filled with a 0.

*Parameter 2: Loads.Idx – Read*

This parameter allows to read the index of the active load. The parameter argument can be filled with a 0.

*Parameter 3: Load.Idx – Write*

This parameter allows to write the index of the active load. The parameter argument must contain the index of the desired active load. The return value will be equal to 0.

*Parameter 4: Load.Count*

This parameter returns the number of load elements within the active circuit. The parameter argument can be filled with a 0.

*Parameter 5: Load.Class – Read*

This parameter allows to read the code number used to separate loads by class or group. The parameter argument can be filled with a 0.

*Parameter 6: Load.Class – Write*

This parameter allows to read the code number used to separate loads by class or group. The parameter argument can be filled with a 0.

*Parameter 7: Load.Model – Read*

This parameter allows to read the model of the active load. The parameter argument can be filled with a 0.



*Parameter 8: Load.Model – Write*

This parameter allows to write the model of the active load using the parameter argument. This parameter will return a 0.

*Parameter 9: Load.NumCust – Read*

This parameter allows to read the number of customer of the active load. The parameter argument can be filled with a 0.

*Parameter 10: Load.NumCust – Write*

This parameter allows to write the number of customers of the active load using the parameter argument. This parameter will return a 0.

*Parameter 11: Load.Status – Read*

This parameter allows to read Response to load multipliers: Fixed (growth only – “1”), Exempt (no LD curve - “2”), Variable (all – “0”), of the active load. The parameter argument can be filled with a 0.

*Parameter 12: Load.Status – Write*

This parameter allows to write the response to load multipliers: Fixed (growth only – “1”), Exempt (no LD curve – “2”), Variable (all – “0”), of the active load using the parameter argument. This parameter will return a 0.

*Parameter 13: Load.IsDelta – Read*

This parameter allows to read if the active load is connected in delta, if the answer is positive, this function will deliver a 1; otherwise, the answer will be 0. The parameter argument can be filled with a 0.

*Parameter 14: Load.IsDelta – Write*

This parameter allows to write if the active load is connected in delta, if it is, the argument variable must contain a 1; otherwise, 0. The parameter argument can be filled with a 0. This parameter will return a 0.

## **Loads F (Float) Interface**

This interface can be used to read/modify the properties of the Loads Class where the values are floating point numbers (double). The structure of the interface is as follows:

```
double DSSLoadsF(int32_t Parameter, double Argument);
```

This interface returns a Double (IEEE 754 64 bits), the variable “parameter” (Integer) is used to specify the property of the class to be used and the variable “argument” (double) can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Loads.kw – Read*

This parameter allows to read the kW property of the active load. The parameter argument can be filled with a 0.

*Parameter 1: Load.kw – Write*

This parameter allows to write the kW property of the active load. The parameter argument must contain the new value in kW for the desired active load. The return value will be equal to 0.

*Parameter 2: Loads.kV – Read*

This parameter allows to read the kV property of the active load. The parameter argument can be filled with a 0.

*Parameter 3: Load.kV – Write*

This parameter allows to write the kV property of the active load. The parameter argument must contain the new value in kV for the desired active load. The return value will be equal to 0.

*Parameter 4: Loads.kvar – Read*

This parameter allows to read the kvar property of the active load. The parameter argument can be filled with a 0.

*Parameter 5: Load.kvar – Write*

This parameter allows to write the kvar property of the active load. The parameter argument must contain the new value in kvar for the desired active load. The return value will be equal to 0.

*Parameter 6: Loads.pf – Read*

This parameter allows to read the pf property of the active load. The parameter argument can be filled with a 0.

*Parameter 7: Load.pf – Write*

This parameter allows to write the pf property of the active load. The parameter argument must contain the new value in pf for the desired active load. The return value will be equal to 0.

*Parameter 8: Loads.PctMean – Read*

This parameter allows to read the PctMean property of the active load. The parameter argument can be filled with a 0.

*Parameter 9: Load.PctMean – Write*

This parameter allows to write the PctMean property of the active load. The parameter argument must contain the new value in PctMean for the desired active load. The return value will be equal to 0.

*Parameter 10: Loads.PctStdDev – Read*

This parameter allows to read the PctStdDev property of the active load. The parameter argument can be filled with a 0.

*Parameter 11: Load.PctStdDev – Write*

This parameter allows to write the PctStdDev property of the active load. The parameter argument must contain the new value in PctStdDev for the desired active load. The return value will be equal to 0.

*Parameter 12: Loads.AllocationFactor – Read*

This parameter allows to read the *AllocationFactor* property of the active load. The parameter argument can be filled with a 0.

*Parameter 13: Load. AllocationFactor – Write*

This parameter allows to write the *AllocationFactor* property of the active load. The parameter argument must contain the new value in *AllocationFactor* for the desired active load. The return value will be equal to 0.

*Parameter 14: Loads.CFactor – Read*

This parameter allows to read the *CFactor* property of the active load. The parameter argument can be filled with a 0.

*Parameter 15: Load.CFactor – Write*

This parameter allows to write the *CFactor* property of the active load. The parameter argument must contain the new value in *CFactor* for the desired active load. The return value will be equal to 0.

*Parameter 16: Loads.CVRWatts – Read*

This parameter allows to read the *CVRWatts* property of the active load. The parameter argument can be filled with a 0.

*Parameter 17: Load.CVRWatts – Write*

This parameter allows to write the *CVRWatts* property of the active load. The parameter argument must contain the new value in *CVRWatts* for the desired active load. The return value will be equal to 0.

*Parameter 18: Loads.CVRvars – Read*

This parameter allows to read the *CVRvars* property of the active load. The parameter argument can be filled with a 0.

*Parameter 19: Load.CVRvars – Write*

This parameter allows to write the *CVRvars* property of the active load. The parameter argument must contain the new value in *CVRvars* for the desired active load. The return value will be equal to 0.

*Parameter 20: Loads.kva – Read*

This parameter allows to read the *kva* property of the active load. The parameter argument can be filled with a 0.

*Parameter 21: Load.kva – Write*

This parameter allows to write the *kva* property of the active load. The parameter argument must contain the new value in *kva* for the desired active load. The return value will be equal to 0.

*Parameter 22: Loads.kWh – Read*

This parameter allows to read the *kWh* property of the active load. The parameter argument can be filled with a 0.

*Parameter 23: Load.kWh – Write*

This parameter allows to write the *kWh* property of the active load. The parameter argument must contain the new value in *kWh* for the desired active load. The return value will be equal to 0.

*Parameter 24: Loads.kWhdays – Read*

This parameter allows to read the *kWhdays* property of the active load. The parameter argument can be filled with a 0.

*Parameter 25: Load.kWhdays – Write*

This parameter allows to write the *kWhdays* property of the active load. The parameter argument must contain the new value in *kWhdays* for the desired active load. The return value will be equal to 0.

*Parameter 26: Loads.RNeut – Read*

This parameter allows to read the *RNeut* (*neutral resistance for wye connected loads*) property of the active load. The parameter argument can be filled with a 0.

*Parameter 27: Load.RNeut – Write*

This parameter allows to write the *RNeut* (*neutral resistance for wye connected loads*) property of the active load. The parameter argument must contain the new value in *RNeut* for the desired active load. The return value will be equal to 0.

*Parameter 28: Loads.VMaxpu – Read*

This parameter allows to read the *VMaxpu* property of the active load. The parameter argument can be filled with a 0.

*Parameter 29: Load.VMaxpu – Write*

This parameter allows to write the *VMaxpu* property of the active load. The parameter argument must contain the new value in *VMaxpu* for the desired active load. The return value will be equal to 0.

*Parameter 30: Loads.VMinemerg – Read*

This parameter allows to read the *VMinemerg* property of the active load. The parameter argument can be filled with a 0.

*Parameter 31: Load.VMinemerg – Write*

This parameter allows to write the *VMinemerg* property of the active load. The parameter argument must contain the new value in *VMinemerg* for the desired active load. The return value will be equal to 0.

*Parameter 32: Loads.VMinnorm – Read*

This parameter allows to read the *VMinnorm* property of the active load. The parameter argument can be filled with a 0.

*Parameter 33: Load.VMinnorm – Write*

This parameter allows to write the *VMinnorm* property of the active load. The parameter argument must contain the new value in *VMinnorm* for the desired active load. The return value will be equal to 0.

*Parameter 34: Loads.VMinpu – Read*

This parameter allows to read the *VMinpu* property of the active load. The parameter argument can be filled with a 0.

*Parameter 35: Load.VMinpu – Write*

This parameter allows to write the *VMinpu* property of the active load. The parameter argument must contain the new value in *VMinpu* for the desired active load. The return value will be equal to 0.

*Parameter 36: Loads.xfKVA – Read*

This parameter allows to read the *xfKVA* (*Rated service transformer KVA for load allocation, using Allocationfactor. Affects kW, kvar and pf.*) property of the active load. The parameter argument can be filled with a 0.

*Parameter 37: Load.xfKVA – Write*

This parameter allows to write the *xfKVA* (*Rated service transformer KVA for load allocation, using Allocationfactor. Affects kW, kvar and pf.*) property of the active load. The parameter argument must contain the new value in *xfKVA* for the desired active load. The return value will be equal to 0.

*Parameter 38: Loads.Xneut – Read*

This parameter allows to read the *Xneut* property of the active load. The parameter argument can be filled with a 0.

*Parameter 39: Load.Xneut – Write*

This parameter allows to write the *Xneut* property of the active load. The parameter argument must contain the new value in *Xneut* for the desired active load. The return value will be equal to 0.

*Parameter 40: Loads.PctSeriesRL – Read*

This parameter allows to read the *PctSeriesRL* (*Percent of Load that is modeled as series R-L for harmonic studies*) property of the active load. The parameter argument can be filled with a 0.

*Parameter 41: Load.PctSeriesRL – Write*

This parameter allows to write the *PctSeriesRL* (*Percent of Load that is modeled as series R-L for harmonic studies*) property of the active load. The parameter argument must contain the new value in *PctSeriesRL* for the desired active load. The return value will be equal to 0.

*Parameter 42: Loads.RelWeight – Read*

This parameter allows to read the *RelWeight* (*relative weighting factor*) property of the active load. The parameter argument can be filled with a 0.

*Parameter 43: Loads.RelWeight – Write*

This parameter allows to write the *RelWeight* (*relative weighting factor*) property of the active load. The parameter argument must contain the new value in *RelWeight* for the desired active load. The return value will be equal to 0.

## **Loads S (String) Interface**

This interface can be used to read/modify the properties of the Loads Class where the values are strings. The structure of the interface is as follows:

```
CStr DSSLoadsS(int32_t Parameter, CStr Argument);
```

This interface returns a string, the variable “parameter” (Integer) is used to specify the property of the class to be used and the variable “argument” (string) can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

*Parameter 0: Loads.Name – Read*

This parameter allows to read the *Name* property of the active load. The parameter argument can be filled with an empty string.

*Parameter 1: Loads.Name – Write*

This parameter allows to set the active load by specifying the *Name* load. The parameter argument must contain the Name of the load to activate. The return value will be equal to empty.

*Parameter 2: Loads.CVRCurve – Read*

This parameter allows to read the *CVRCurve* property of the active load. The parameter argument can be filled with an empty string.

*Parameter 3: Loads.CVRCurve – Write*

This parameter allows to set the *CVRCurve* property for the active load. The parameter argument must contain the Name of the new *CVRCurve* to be linked to the active load. The return value will be equal to empty.

*Parameter 4: Loads.daily – Read*

This parameter allows to read the *daily* property of the active load. The parameter argument can be filled with an empty string.

*Parameter 5: Loads.daily – Write*

This parameter allows to set the *daily* property for the active load. The parameter argument must contain the Name of the new *daily* to be linked to the active load. The return value will be equal to empty.

*Parameter 6: Loads.duty – Read*

This parameter allows to read the *duty* property of the active load. The parameter argument can be filled with an empty string.

*Parameter 7: Loads.duty – Write*

This parameter allows to set the *duty* property for the active load. The parameter argument must contain the Name of the new *duty* to be linked to the active load. The return value will be equal to empty.

*Parameter 8: Loads.Spectrum – Read*

This parameter allows to read the *Spectrum* property of the active load. The parameter argument can be filled with an empty string.

*Parameter 9: Loads.Spectrum – Write*

This parameter allows to set the *Spectrum* property for the active load. The parameter argument must contain the Name of the new *Spectrum* to be linked to the active load. The return value will be equal to empty.

*Parameter 10: Loads.Yearly – Read*

This parameter allows to read the *Yearly* property of the active load. The parameter argument can be filled with an empty string.

*Parameter 11: Loads.Yearly – Write*

This parameter allows to set the *Yearly* property for the active load. The parameter argument must contain the Name of the new *Yearly* to be linked to the active load. The return value will be equal to empty.

*Parameter 12: Loads.Growth – Read*

This parameter allows to read the *Growth* property of the active load. The parameter argument can be filled with an empty string.

*Parameter 13: Loads.Growth – Write*

This parameter allows to set the *Growth* property for the active load. The parameter argument must contain the Name of the new *Growth* to be linked to the active load. The return value will be equal to empty.

## **Loads V (Variant) Interface**

This interface can be used to read/modify the properties of the Loads Class where the values are variants (the value can have different formats). The structure of the interface is as follows:

```
void DSSLoadsV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a string, the variable “parameter” (Integer) is used to specify the property of the class to be used and the variable “argument” (Variant) is used to return the variant structure.

*Parameter 0: Loads.AllNames*

This parameter allows to read the names of all the loads present in the active circuit. The result is delivered as variant, however, the content of this variant is an array of strings.

*Parameter 1: Loads.ZIPV - Read*

This parameter allows to read the array of 7 elements (doubles) for ZIP property of the active Load object.

*Parameter 2: Loads.ZIPV - Write*

This parameter allows to write the array of 7 elements (doubles) for ZIP property of the active Load object.

## DSSProperties Interface

This interface implements the DSSproperties (IDSSProperties) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

## DSSProperties Interface

This interface can be used to read/write certain properties of DSS objects. The structure of the interface is as follows:

```
CStr DSSProperties(int32_t Parameter, CStr Argument);
```

This interface returns a string pointer (ANSI) with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: DSSProperties.Name*

This parameter will deliver the name of the active property.

*Parameter 1: DSSProperties.Description*

This parameter will deliver the description of the active property.

*Parameter 2: DSSProperties.Value - read*

This parameter will deliver the value of the active property.

*Parameter 3: DSSProperties.Value - Write*

This parameter will allow to set the value of the active property. The new value must be specified in the variable “argument” as string.

## Text Interface

This interface can be used to send commands to the text interface of OpenDSS (DSS.Text). The structure of the interface is as follows:

```
CStr DSSPut_Command(CStr Command);
```

This interface returns a string pointer (ANSI) with the result of the command sent, the variable "Command" is used as input to send an OpenDSS command to the Text interface of OpenDSS.

## Lines Interface

This interface implements the Lines (ILines) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### LinesI (Int) Interface

This interface can be used to read/modify the properties of the Lines Class where the values are integers. The structure of the interface is as follows:

```
int32_t LinesI(int32_t Parameter, int32_t argument)
```

This interface returns an integer (signed 32 bits), the variable "parameter" is used to specify the property of the class to be used and the variable "argument" can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Lines.First*

This parameter sets the first element active. Returns 0 if no lines. Otherwise, index of the line element.

*Parameter 1: Lines.Next*

This parameter sets the next element active. Returns 0 if no lines. Otherwise, index of the line element.

*Parameter 2: Lines.Phases read*

This parameter gets the number of phases of the active line object.

*Parameter 3: Lines.Phases write*

This parameter sets the number of phases of the active line object.

*Parameter 4: Lines.NumCust*

This parameter gets the number of customers on this line section.

*Parameter 5: Lines.Parent*

This parameter gets the parents of the active Line to be the active Line. Return 0 if no parent or action fails.

*Parameter 6: Lines.Count*

This parameter gets the number of Line Objects in Active Circuit.

*Parameter 7: Lines.Units read*

This parameter gets the units of the line (distance, check manual for details).

*Parameter 8: Lines.Units write*

This parameter sets the units of the line (distance, check manual for details).



## LinesF (Float) Interface

This interface can be used to read/modify the properties of the Lines Class where the values are doubles. The structure of the interface is as follows:

`double LinesF(int32_t Parameter, double argument)`

This interface returns a floating point number, the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Lines.Length read*

This parameter gets the length of line section in units compatible with the LineCode definition.

*Parameter 1: Lines.Length write*

This parameter sets the length of line section in units compatible with the LineCode definition.

*Parameter 2: Lines.R1 read*

This parameter gets the positive sequence resistance, ohm per unit length.

*Parameter 3: Lines.R1 write*

This parameter sets the positive sequence resistance, ohm per unit length.

*Parameter 4: Lines.X1 read*

This parameter gets the positive sequence reactance, ohm per unit length.

*Parameter 5: Lines.X1 write*

This parameter sets the positive sequence reactance, ohm per unit length.

*Parameter 6: Lines.R0 read*

This parameter gets the zero sequence resistance, ohm per unit length.

*Parameter 7: Lines.R0 write*

This parameter sets the zero sequence resistance, ohm per unit length.

*Parameter 8: Lines.X0 read*

This parameter gets the zero sequence reactance, ohm per unit length.

*Parameter 9: Lines.X0 write*

This parameter sets the zero sequence reactance, ohm per unit length.

*Parameter 10: Lines.C1 read*

This parameter gets the positive sequence capacitance, nanofarads per unit length.

*Parameter 11: Lines.C1 write*

This parameter sets the positive sequence capacitance, nanofarads per unit length.

*Parameter 12: Lines.CO read*

This parameter gets the zero sequence capacitance, nanofarads per unit length.

*Parameter 13: Lines.CO write*

This parameter sets the zero sequence capacitance, nanofarads per unit length.

*Parameter 14: Lines.NormAmps read*

This parameter gets the normal ampere rating of Line.

*Parameter 15: Lines.NormAmps write*

This parameter sets the normal ampere rating of Line.

*Parameter 16: Lines.EmergAmps read*

This parameter gets the emergency (maximum) ampere rating of Line.

*Parameter 17: Lines.EmergAmps write*

This parameter sets the emergency (maximum) ampere rating of Line.

*Parameter 18: Lines.Rg read*

This parameter gets the earth return value used to compute line impedances at power frequency.

*Parameter 19: Lines.Rg write*

This parameter sets the earth return value used to compute line impedances at power frequency.

*Parameter 20: Lines.Xg read*

This parameter gets the earth return reactance value used to compute line impedances at power frequency.

*Parameter 21: Lines.Xg write*

This parameter sets the earth return reactance value used to compute line impedances at power frequency.

*Parameter 22: Lines.Rho read*

This parameter gets the earth resistivity, m-ohms.

*Parameter 23: Lines.Rho write*

This parameter sets the earth resistivity, m-ohms.

## **LinesS (String) Interface**

This interface can be used to read/modify the properties of the Lines Class where the values are Strings. The structure of the interface is as follows:

CStr LinesS(int32\_t Parameter, CStr argument)

This interface returns a string, the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Lines.Name read*

This parameter gets the name of the active Line element.

*Parameter 1: Lines.Name write*

This parameter sets the name of the Line element to set it active.

*Parameter 2: Lines.Bus1 read*

This parameter gets the name of bus for terminal 1.

*Parameter 3: Lines.Bus1 write*

This parameter sets the name of bus for terminal 1.

*Parameter 4: Lines.Bus2 read*

This parameter gets the name of bus for terminal 2.

*Parameter 5: Lines.Bus2 write*

This parameter sets the name of bus for terminal 2.

*Parameter 6: Lines.LineCode read*

This parameter gets the name of LineCode object that defines the impedances.

*Parameter 7: Lines.LineCode write*

This parameter sets the name of LineCode object that defines the impedances.

*Parameter 8: Lines.Geometry read*

This parameter gets the name of the Line geometry code.

*Parameter 9: Lines.Geometry write*

This parameter sets the name of the Line geometry code.

*Parameter 10: Lines.Spacing read*

This parameter gets the name of the Line spacing code.

*Parameter 11: Lines.Spacing write*

This parameter sets the name of the Line spacing code.

## **LinesV (Variant) Interface**

This interface can be used to read/modify the properties of the Lines Class where the values are Variants. The structure of the interface is as follows:

```
void LinesV(int32_t Parameter, , VARIANT *Argument);
```

This interface returns a Variant, the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Lines.AllNames*

This parameter gets the name of all Line Objects.

*Parameter 1: Lines.RMatrix read*

This parameter gets the resistance matrix (full), ohms per unit length. Variant array of doubles.

*Parameter 2: Lines.RMatrix write*

This parameter sets the resistance matrix (full), ohms per unit length. Variant array of doubles.

*Parameter 3: Lines.XMatrix read*

This parameter gets the reactance matrix (full), ohms per unit length. Variant array of doubles.

*Parameter 4: Lines.XMatrix write*

This parameter sets the reactance matrix (full), ohms per unit length. Variant array of doubles.

*Parameter 5: Lines.CMatrix read*

This parameter gets the capacitance matrix (full), nanofarads per unit length. Variant array of doubles.

*Parameter 6: Lines.CMatrix write*

This parameter sets the capacitance matrix (full), nanofarads per unit length. Variant array of doubles.

*Parameter 7: Lines.YPrim read*

This parameter gets the YPrimitive of the active Line.

*Parameter 8: Lines.YPrim write*

This parameter does nothing at present.

## CtrlQueue Interface

This interface implements the CtrlQueue (ICtrlQueue) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### CtrlQueueI (Int) Interface

This interface can be used to read/modify the properties of the CtrlQueue Class where the values are integers. The structure of the interface is as follows:

```
int32_t CtrlQueueI(int32_t Parameter, int32_t argument)
```

This interface returns an integer (signed 32 bits), the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: CtrlQueue.ClearQueue*

This parameter clears the control queue.

*Parameter 1: CtrlQueue.Delete*

This parameter delete a control action from the DSS control queue by referencing the handle of the action (Argument).

*Parameter 2: CtrlQueue.NumActions*

This parameter gets the number of actions on the current action list (that have been popped off the control queue by CheckControlActions).

*Parameter 3: CtrlQueue.Action*

This parameter sets the active action by index (argument).

*Parameter 4: CtrlQueue.ActionCode*

This parameter gets the code for the active action. Long integer code to tell the control device what to do.

*Parameter 5: CtrlQueue.DeviceHandle*

This parameter gets the handle (user defined) to device that must act on the pending action.

*Parameter 6: CtrlQueue.Push*

This parameter push a control action onto the DSS control queue by time, action code, and device handle. Returns Control Queue handle.

*Parameter 7: CtrlQueue.Show*

This parameter shows the entire control queue in CSV format.

*Parameter 8: CtrlQueue.ClearActions*

This parameter clears the action list.

*Parameter 9: CtrlQueue.PopAction*

This parameter pops next action off the action list and makes it the active action. Returns zero if none.

*Parameter 10: CtrlQueue.QueueSize*

This parameter delivers the size of the current control queue. Returns zero if none.

*Parameter 11: CtrlQueue.DoAllQueue*

This parameter forces the execution of all control actions stored at the control queue. Returns 0.

## **CtrlQueueV (Variant) Interface**

This interface can be used to read/modify the properties of the CtrlQueue Class where the values are Variants. The structure of the interface is as follows:

```
void CtrlQueueV(int32_t Parameter, , VARIANT *Argument);
```

This interface returns a Variant, the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: CtrlQueue.CtrlQueue*

This parameter delivers the control actions contained in the CtrlQueue after the latest solve command.

## **DSSElement Interface**

This interface implements the DSSElement (IDSSElement) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

## **DSSElementI (Int) Interface**

This interface can be used to read/modify the properties of the DSSElement Class where the values are integers. The structure of the interface is as follows:

```
int32_t DSSElementI(int32_t Parameter, int32_t argument) ;
```

This interface returns an integer (signed 32 bits), the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: DSSElement.NumProperties*

This parameter gets the number of properties for the active DSS object.

## **DSSElementS (String) Interface**

This interface can be used to read/modify the properties of the DSSElement Class where the values are Strings. The structure of the interface is as follows:

```
CStr DSSElementS(int32_t Parameter, CStr argument) ;
```

This interface returns a string, the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: DSSElement.Name*

This parameter gets the full name of the active DSS object (general element or circuit element).

## **DSSElementV (Variant) Interface**

This interface can be used to read/modify the properties of the DSSElement Class where the values are Variants. The structure of the interface is as follows:

```
void DSSElementV(int32_t Parameter VARIANT *Argument) ;
```

This interface returns a Variant, the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: DSSElement.AllPropertyNamees*

This parameter gets a variant array of strings containing the names of all properties for the active DSS object.

## **ActiveClass Interface**

This interface implements the ActiveClass (IActiveClass) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

## **ActiveClassI (Int) Interface**

This interface can be used to read/modify the properties of the ActiveClass Class where the values are integers. The structure of the interface is as follows:

```
int32_t ActiveClassI(int32_t Parameter, int32_t argument) ;
```

This interface returns an integer (signed 32 bits), the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: ActiveClass.First*

This parameter sets first element in the active class to be the active DSS object. If object is a CktElement, ActiveCktElement also points to this element. Returns 0 if none.

*Parameter 1: ActiveClass.Next*

This parameter sets next element in the active class to be the active DSS object. If object is a CktElement, ActiveCktElement also points to this element. Returns 0 if none.

*Parameter 2: ActiveClass.NumElements*

This parameter gets the number of elements in this class. Same as Count Property.

*Parameter 3: ActiveClass.Count*

This parameter gets the number of elements in this class. Same as NumElements Property.

## **ActiveClassS (String) Interface**

This interface can be used to read/modify the properties of the ActiveClass Class where the values are strings. The structure of the interface is as follows:

```
CStr ActiveClassI(int32_t Parameter, CStr argument) ;
```

This interface returns a string, the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: ActiveClass.Name read*

This parameter gets the name of the active Element of the Active class.

*Parameter 1: ActiveClass.Name write*

This parameter sets the name of the active Element of the Active class.

*Parameter 2: ActiveClass.ActiveClassName*

This parameter sets the name of the active Element of the Active class.

## **ActiveClassV (Variant) Interface**

This interface can be used to read/modify the properties of the ActiveClass Class where the values are Variants. The structure of the interface is as follows:

```
void ActiveClassI(int32_t Parameter, VARIANT *Argument) ;
```

This interface returns a Variant, the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: ActiveClass.AllNames*

This parameter gets a variant array of strings consisting of all element names in the active Class.

## Capacitors Interface

This interface implements the Capacitors (ICapacitors) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### CapacitorsI (Int) Interface

This interface can be used to read/modify the properties of the Capacitors Class where the values are integers. The structure of the interface is as follows:

```
int32_t CapacitorsI(int32_t Parameter, int32_t argument) ;
```

This interface returns an integer (signed 32 bits), the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Capacitors.NumSteps read*

This parameter gets the number of steps (defaults 1) for distributing and switching the total bank kvar.

*Parameter 1: Capacitors.NumSteps write*

This parameter sets the number of steps (defaults 1) for distributing and switching the total bank kvar.

*Parameter 2: Capacitors.IsDelta read*

This parameter gets 1 if delta connection, otherwise will return 0 for distributing and switching the total kvar.

*Parameter 3: Capacitors.IsDelta write*

This parameter sets (Argument) 1 if delta connection, otherwise will return 0 for distributing and switching the total kvar.

*Parameter 4: Capacitors.First*

This parameter sets the first capacitor active. Returns 0 if no more.

*Parameter 5: Capacitors.Next*

This parameter sets the next capacitor active. Returns 0 if no more.

*Parameter 6: Capacitors.Count*

This parameter gets the number of capacitor objects in active circuit.

*Parameter 7: Capacitors.AddStep*

This parameter adds one step of the capacitor if available. If successful returns 1.

*Parameter 8: Capacitors.SubtractStep*

This parameter subtract one step of the capacitor if available. If no more steps returns 0.

*Parameter 9: Capacitors.AvailableSteps*

This parameter gets the number of steps available in cap bank to be switched ON.

*Parameter 10: Capacitors.Open*

This parameter opens all steps, all phases of the capacitor.

*Parameter 11: Capacitors.Close*

This parameter closes all steps, all phases of the capacitor.



## CapacitorsF (Float) Interface

This interface can be used to read/modify the properties of the Capacitors Class where the values are doubles. The structure of the interface is as follows:

```
double CapacitorsF(int32_t Parameter, double argument) ;
```

This interface returns a floating point number (64 bits), the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Capacitors.kV read*

This parameter gets the bank rating. Use LL for 2 or 3 phases, or actual can rating for 1 phase.

*Parameter 1: Capacitors.kV write*

This parameter sets the bank rating. Use LL for 2 or 3 phases, or actual can rating for 1 phase.

*Parameter 2: Capacitors.kvar read*

This parameter gets the total bank kvar, distributed equally among phases and steps.

*Parameter 3: Capacitors.kvar write*

This parameter sets the total bank kvar, distributed equally among phases and steps.

## CapacitorsS (String) Interface

This interface can be used to read/modify the properties of the Capacitors Class where the values are Strings. The structure of the interface is as follows:

```
CStr CapacitorsS(int32_t Parameter, CStr argument) ;
```

This interface returns a string, the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Capacitors.Name read*

This parameter gets the active capacitor by Name.

*Parameter 1: Capacitors.Name write*

This parameter sets the active capacitor by Name.

## CapacitorsV (Variant) Interface

This interface can be used to read/modify the properties of the Capacitors Class where the values are Variants. The structure of the interface is as follows:

```
void CapacitorsV(int32_t Parameter, VARIANT *Argument) ;
```

This interface returns a Variant, the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Capacitors.AllNames*

This parameter gets a variant array of strings with all Capacitor names in the circuit.

*Parameter 1: Capacitors.States read*

This parameter gets a variant array of integers [0..numsteps-1] indicating the state of each step. If value is -1 and error has occurred.

*Parameter 2: Capacitors.States write*

This parameter sets a variant array of integers [0..numsteps-1] indicating the state of each step. If value is -1 and error has occurred.

## Transformers Interface

This interface implements the Transformers (ITransformer) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### TransformersI (Int) Interface

This interface can be used to read/modify the properties of the Transformers Class where the values are integers. The structure of the interface is as follows:

```
int32_t TransformersI(int32_t Parameter, int32_t argument) ;
```

This interface returns an integer (signed 32 bits), the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Transformers.NumWindings read*

This parameter gets the number of windings on this transformer. Allocates memory; set or change this property first.

*Parameter 1: Transformers.NumWindings write*

This parameter sets the number of windings on this transformer. Allocates memory; set or change this property first.

*Parameter 2: Transformers.Wdg read*

This parameter gets the active winding number from 1..NumWindings. Update this before reading or setting a sequence of winding properties (R, Tap, kV, kVA, etc.).

*Parameter 3: Transformers.Wdg write*

This parameter sets the active winding number from 1..NumWindings. Update this before reading or setting a sequence of winding properties (R, Tap, kV, kVA, etc.).

*Parameter 4: Transformers.NumTaps read*

This parameter gets the active winding number of tap steps between MinTap and MaxTap.

*Parameter 5: Transformers.NumTaps write*

This parameter sets the active winding number of tap steps between MinTap and MaxTap

*Parameter 6: Transformers.IsDelta read*

This parameter gets the information about if the active winding is delta (1) or wye (0) connection.

*Parameter 7: Transformers.IsDelta write*

This parameter sets the information about if the active winding is delta (1) or wye (0) connection.

*Parameter 8: Transformers.First*

This parameter sets the first Transformer active. Return 0 if no more.

*Parameter 9: Transformers.Next*

This parameter sets the next Transformer active. Return 0 if no more.

*Parameter 10: Transformers.Count*

This parameter gets the number of transformers within the active circuit.

## **TransformersF (Float) Interface**

This interface can be used to read/modify the properties of the Transformers Class where the values are doubles. The structure of the interface is as follows:

```
double TransformersF(int32_t Parameter, double argument) ;
```

This interface returns a floating point number (64 bits), the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Transformers.R read*

This parameter gets the active winding resistance in %.

*Parameter 1: Transformers.R write*

This parameter sets the active winding resistance in %.

*Parameter 2: Transformers.Tap read*

This parameter gets the active winding tap in per-unit.

*Parameter 3: Transformers.Tap write*

This parameter sets the active winding tap in per-unit.

*Parameter 4: Transformers.MinTap read*

This parameter gets the active winding minimum tap in per-unit.

*Parameter 5: Transformers.MinTap write*

This parameter sets the active winding minimum tap in per-unit.

*Parameter 6: Transformers.MaxTap read*

This parameter gets the active winding maximum tap in per-unit.

*Parameter 7: Transformers.MaxTap write*

This parameter sets the active winding maximum tap in per-unit.

*Parameter 8: Transformers.kV read*

This parameter gets the active winding kV rating. Phase-phase for 2 or 3 phases, actual winding kV 1 phase transformer.

*Parameter 9: Transformers.kV write*

This parameter sets the active winding kV rating. Phase-phase for 2 or 3 phases, actual winding kV 1 phase transformer.

*Parameter 10: Transformers.kVA read*

This parameter gets the active winding kVA rating. On winding 1, this also determines normal and emergency current ratings for all windings.

*Parameter 11: Transformers.kVA write*

This parameter sets the active winding kVA rating. On winding 1, this also determines normal and emergency current ratings for all windings.

*Parameter 12: Transformers.Xneut read*

This parameter gets the active winding neutral reactance [ohms] for wye connections.

*Parameter 13: Transformers.Xneut write*

This parameter sets the active winding neutral reactance [ohms] for wye connections.

*Parameter 14: Transformers.Rneut read*

This parameter gets the active winding neutral resistance [ohms] for wye connections. Set less than zero ungrounded wye.

*Parameter 15: Transformers.Rneut write*

This parameter sets the active winding neutral resistance [ohms] for wye connections. Set less than zero ungrounded wye.

*Parameter 16: Transformers.Xhl read*

This parameter gets the percent reactance between windings 1 and 2, on winding 1 kVA base. Use for 2 winding or 3 winding transformers.

*Parameter 17: Transformers.Xhl write*

This parameter sets the percent reactance between windings 1 and 2, on winding 1 kVA base. Use for 2 winding or 3 winding transformers.

*Parameter 18: Transformers.Xht read*

This parameter gets the percent reactance between windings 1 and 3, on winding 1 kVA base. Use for 3 winding transformers only.

*Parameter 19: Transformers.Xht write*

This parameter sets the percent reactance between windings 1 and 3, on winding 1 kVA base. Use for 3 winding transformers only.

*Parameter 20: Transformers.Xlt read*

This parameter gets the percent reactance between windings 2 and 3, on winding 1 kVA base. Use for 3 winding transformers only.

*Parameter 21: Transformers.Xlt write*

This parameter sets the percent reactance between windings 2 and 3, on winding 1 kVA base. Use for 3 winding transformers only.

## **TransformersS (String) Interface**

This interface can be used to read/modify the properties of the Transformers Class where the values are Strings. The structure of the interface is as follows:

```
CStr TransformersS(int32_t Parameter, CStr argument) ;
```

This interface returns a string, the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Transformers.XfmrCode read*

This parameter gets the name of an XfmrCode that supplies electrical parameters for this transformer.

*Parameter 1: Transformers.XfmrCode write*

This parameter sets the name of an XfmrCode that supplies electrical parameters for this transformer.

*Parameter 2: Transformers.Name read*

This parameter gets the active transformer name.

*Parameter 3: Transformers.Name write*

This parameter sets the active transformer by name

## **TransformersV (Variant) Interface**

This interface can be used to read/modify the properties of the Transformers Class where the values are Variants. The structure of the interface is as follows:

```
void TransformersV(int32_t Parameter, VARIANT *Argument) ;
```

This interface returns a Variant, the variable “parameter” is used to specify the property of the class to be used and the variable “argument” can be used to modify the value of the property when necessary. Reading and writing properties are separated and require a different parameter number to be executed.

The properties (parameter) are integer numbers and are described as follows:

*Parameter 0: Transformers.AllNames*

This parameter gets a variant array of strings with all Transformer names in the active circuit.

## **SwtControls Interface**

This interface implements the SwtControls (ISwtControls) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

## **SwtControlsI (Int) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t SwtControlsI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: SwtControls.First*

This parameter sets the first SwtControl active. Returns 0 if no more.

*Parameter 1: SwtControls.Next*

This parameter sets the next SwtControl active. Returns 0 if no more.

*Parameter 2: SwtControls.Action read*

This parameter gets the open (1) or close (2) action of the switch. No effect if switch is locked. However, reset removes any lock and then closes the switch (shelf state). 0 = none action.

*Parameter 3: SwtControls.Action write*

This parameter sets open (1) or close (2) the switch. No effect if switch is locked. However, reset removes any lock and then closes the switch (shelf state). 0 = none action (see manual for details).

*Parameter 4: SwtControls.IsLocked read*

This parameter gets the lock state: {1 locked | 0 not locked}.

*Parameter 5: SwtControls.IsLocked write*

This parameter sets the lock to prevent both manual and automatic switch operation.

*Parameter 6: SwtControls.SwitchedTerm read*

This parameter gets the terminal number where the switch is located on the SwitchedObj.

*Parameter 7: SwtControls.SwitchedTerm write*

This parameter sets the terminal number where the switch is located on the SwitchedObj.

*Parameter 8: SwtControls.Count*

This parameter gets the total number of SwtControls in the active circuit.

## **SwtControlsF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double SwtControlsF(int32_t Parameter, double Argument);
```

This interface returns a floating point number (64 bits) with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: SwtControls.Delay read*

This parameter gets the time delay [s] between arming and opening or closing the switch. Control may reset before actually operating the switch.

*Parameter 1: SwtControls.Delay write*

This parameter sets the time delay [s] between arming and opening or closing the switch. Control may reset before actually operating the switch.

## **SwtControlsS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr SwtControlsS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: SwtControls.Name read*

This parameter gets the name of the active SwtControl.

*Parameter 1: SwtControls.Name write*

This parameter sets a SwtControl active by name.

*Parameter 2: SwtControls.SwitchedObj read*

This parameter gets the name of the switched object by the active SwtControl.

*Parameter 3: SwtControls.SwitchedObj write*

This parameter sets the switched object by name.

## **SwtControlsV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void SwtControlsV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: SwtControls.AllNames read*

This parameter gets a variant array of strings with all SwtControl names in the active circuit.

## **CapControls Interface**

This interface implements the CapControls (ICapControls) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

## **CapControlsI (Int) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t CapControlsI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: CapControls.First*

This parameter sets the first CapControl active. Returns 0 if no more.

*Parameter 1: CapControls.Next*

This parameter sets the next CapControl active. Returns 0 if no more.

*Parameter 2: CapControls.Mode read*

This parameter gets the type of automatic controller (see manual for details).

*Parameter 3: CapControls.Mode write*

This parameter sets the type of automatic controller (see manual for details).

*Parameter 4: CapControls.MonitoredTerm read*

This parameter gets the terminal number on the element that PT and CT are connected to.

*Parameter 5: CapControls.MonitoredTerm write*

This parameter sets the terminal number on the element that PT and CT are connected to.

*Parameter 6: CapControls.UseVoltOverride read*

This parameter gets if Vmin and Vmax are enabled to override the control Mode.

*Parameter 7: CapControls.UseVoltOverride write*

This parameter sets if enables Vmin and Vmax to override the control Mode.

*Parameter 8: CapControls.Count*

This parameter gets the number of CapControls in Active Circuit.

## **CapControlsF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double CapControlsF(int32_t Parameter, double Argument);
```

This interface returns a floating point number (64 bits) with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: CapControls.CTRatio read*

This parameter gets the transducer ratio current to control current.

*Parameter 1: CapControls.CTRatio write*

This parameter sets the transducer ratio current to control current.

*Parameter 2: CapControls.PTRatio read*

This parameter gets the transducer ratio from primary feeder to control voltage.

*Parameter 3: CapControls.PTRatio write*

This parameter sets the transducer ratio from primary feeder to control voltage.

*Parameter 4: CapControls.ONSetting read*

This parameter gets the threshold to arm or switch on a step. See Mode for Units.

*Parameter 5: CapControls.ONSetting write*

This parameter sets the threshold to arm or switch on a step. See Mode for Units.

*Parameter 6: CapControls.OFFSetting read*

This parameter gets the threshold to switch off a step. See Mode for Units.

*Parameter 7: CapControls.OFFSetting write*

This parameter sets the threshold to switch off a step. See Mode for Units.

*Parameter 8: CapControls.VMax read*

This parameter gets the Vmax, this reference with VoltOverride, switch off whenever PT voltage exceeds this level.



*Parameter 9: CapControls.VMax write*

This parameter sets the Vmax, this reference with VoltOverride, switch off whenever PT voltage exceeds this level.

*Parameter 10: CapControls.VMin read*

This parameter gets the Vmin, this reference with VoltOverride, switch ON whenever PT voltage drops below this level.

*Parameter 11: CapControls.VMin write*

This parameter sets the Vmin, this reference with VoltOverride, switch ON whenever PT voltage drops below this level.

*Parameter 12: CapControls.Delay read*

This parameter gets the time delay [s] to switch on after arming. Control may reset before actually switching.

*Parameter 13: CapControls.Delay write*

This parameter sets the time delay [s] to switch on after arming. Control may reset before actually switching.

*Parameter 14: CapControls.DelayOff read*

This parameter gets the time delay [s] before switching off a step. Control may reset before actually switching.

*Parameter 15: CapControls.DelayOff write*

This parameter sets the time delay [s] before switching off a step. Control may reset before actually switching.

*Parameter 16: CapControls.DeadTime read*

This parameter gets the time delay [s] after switching off a step. Control may reset before actually switching.

*Parameter 17: CapControls.DeadTime write*

This parameter sets the time delay [s] after switching off a step. Control may reset before actually switching.

## **CapControlsS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr CapControlsS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: CapControls.Name read*

This parameter gets the name of the active CapControl.

*Parameter 1: CapControls.Name write*

This parameter sets a CapControl active by name.

*Parameter 2: CapControls.Capacitor read*

This parameter gets the name of the capacitor that is controlled.

*Parameter 3: CapControls.Capacitor write*

This parameter sets the name of the capacitor that is controlled.

*Parameter 4: CapControls.MonitoredObj read*

This parameter gets the full name of the element that PT and CT are connected to.

*Parameter 5: CapControls.MonitoredObj write*

This parameter sets the full name of the element that PT and CT are connected to.

## **CapControlsV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void CapControlsV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: CapControls.AllNames*

This parameter gets a variant array of string with all CapControl names.

## **RegControls Interface**

This interface implements the RegControls (IRegControls) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

## **RegControlsI (Int) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t RegControlsI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: RegControls.First*

This parameter sets the first RegControl active. Returns 0 if no more.

*Parameter 1: RegControls.Next*

This parameter sets the next RegControl active. Returns 0 if no more

*Parameter 2: RegControls.TapWinding read*

This parameter gets the tapped winding number.

*Parameter 3: RegControls.TapWinding write*

This parameter sets the tapped winding number.

*Parameter 4: RegControls.Winding read*

This parameter gets the winding number for PT and CT connections.

*Parameter 5: RegControls.Winding write*

This parameter sets the winding number for PT and CT connections.

*Parameter 6: RegControls.IsReversible read*

This parameter gets the setting in the reverse direction, usually not applicable to substation transformers.

*Parameter 7: RegControls.IsReversible read*

This parameter sets the different settings for the reverse direction (see Manual for details), usually not applicable to substation transformers.

*Parameter 8: RegControls.IsInverseTime read*

This parameter gets the inverse time feature. Time delay is inversely adjusted, proportional to the amount of voltage outside the regulator band.

*Parameter 9: RegControls.IsInverseTime write*

This parameter sets the inverse time feature. Time delay is inversely adjusted, proportional to the amount of voltage outside the regulator band.

*Parameter 10: RegControls.MaxTapChange read*

This parameter gets the maximum tap change per iteration in STATIC solution mode. 1 is more realistic, 16 is the default for faster solution.

*Parameter 11: RegControls.MaxTapChange write*

This parameter sets the maximum tap change per iteration in STATIC solution mode. 1 is more realistic, 16 is the default for faster solution.

*Parameter 12: RegControls.Count*

This parameter gets the number of RegControl objects in Active Circuit.

*Parameter 13: RegControls.TapNumber read*

This parameter gets the actual tap number of the active RegControl.

*Parameter 14: RegControls.TapNumber write*

This parameter sets the actual tap number of the active RegControl.

## **RegControlsF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double RegControlsF(int32_t Parameter, double Argument);
```

This interface returns a floating point number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: RegControls.CTPrimary read*

This parameter gets the CT primary ampere rating (secondary is 0.2 amperes).

*Parameter 1: RegControls.CTPrimary write*

This parameter sets the CT primary ampere rating (secondary is 0.2 amperes).

*Parameter 2: RegControls.PTRatio read*

This parameter gets the PT ratio for voltage control settings.

*Parameter 3: RegControls.PTRatio write*

This parameter sets the PT ratio for voltage control settings.

*Parameter 4: RegControls.ForwardR read*

This parameter gets the LDC R settings in Volts.

*Parameter 5: RegControls.ForwardR write*

This parameter sets the LDC R settings in Volts.

*Parameter 6: RegControls.ForwardX read*

This parameter gets the LDC X settings in Volts.

*Parameter 7: RegControls.ForwardX write*

This parameter sets the LDC X settings in Volts.

*Parameter 8: RegControls.ReverseR read*

This parameter gets the reverse LDC R settings in Volts.

*Parameter 9: RegControls.ReverseR write*

This parameter sets the reverse LDC R settings in Volts.

*Parameter 10: RegControls.ReverseX read*

This parameter gets the reverse LDC X settings in Volts.

*Parameter 11: RegControls.ReverseX write*

This parameter sets the reverse LDC X settings in Volts.

*Parameter 12: RegControls.Delay read*

This parameter gets the time delay [s] after arming before the first tap change. Control may reset before actually changing taps.

*Parameter 13: RegControls.Delay write*

This parameter sets the time delay [s] after arming before the first tap change. Control may reset before actually changing taps.

*Parameter 14: RegControls.TapDelay read*

This parameter gets the time delay [s] for subsequent tap changes in a set. Control may reset before actually changing taps.

*Parameter 15: RegControls.TapDelay write*

This parameter sets the time delay [s] for subsequent tap changes in a set. Control may reset before actually changing taps.

*Parameter 16: RegControls.VoltageLimit read*

This parameter gets the first house voltage limit on PT secondary base. Setting to 0 disables this function.

*Parameter 17: RegControls.VoltageLimit write*

This parameter sets the first house voltage limit on PT secondary base. Setting to 0 disables this function.

*Parameter 18: RegControls.ForwardBand read*

This parameter gets the regulation bandwidth in forward direction, centered on Vreg.

*Parameter 19: RegControls.ForwardBand write*

This parameter sets the regulation bandwidth in forward direction, centered on Vreg.

*Parameter 20: RegControls.ForwardVreg read*

This parameter gets the target voltage in the forward direction, on PT secondary base.

*Parameter 21: RegControls.ForwardVreg write*

This parameter sets the target voltage in the forward direction, on PT secondary base.

*Parameter 22: RegControls.ReverseBand read*

This parameter gets the bandwidth in reverse direction, centered on reverse Vreg.

*Parameter 23: RegControls.ReverseBand write*

This parameter sets the bandwidth in reverse direction, centered on reverse Vreg.

*Parameter 24: RegControls.ReverseVreg read*

This parameter gets the target voltage in the reverse direction, on PT secondary base.

*Parameter 25: RegControls.ReverseVreg write*

This parameter sets the target voltage in the reverse direction, on PT secondary base.

## **RegControlsS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr RegControlsS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: RegControls.Name read*

This parameter gets the active RegControl name.

*Parameter 1: RegControls.Name write*

This parameter sets the active RegControl name.

*Parameter 2: RegControls.MonitoredBus read*

This parameter gets the name of the remote regulated bus, in lieu of LDC settings.

*Parameter 3: RegControls.MonitoredBus write*

This parameter sets the name of the remote regulated bus, in lieu of LDC settings.

*Parameter 4: RegControls.Transformer read*

This parameter gets the name of the transformer this regulator controls.

*Parameter 5: RegControls.Transformer write*

This parameter sets the name of the transformer this regulator controls.

## **RegControlsV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void RegControlsV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: RegControls.AllNames*

This parameter gets a variant array of strings containing all RegControl names.

## Topology Interface

This interface implements the Topology (ITopology) interface of OpenDSS by declaring 3 procedures for accessing the different properties included in this interface.

## Tolopolgyl (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t TopologyI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Topology.NumLoops*

This parameter gets the number of loops.

*Parameter 1: Topology.NumIsolatedBranches*

This parameter gets the number of isolated branches (PD elements and capacitors).

*Parameter 2: Topology.NumIsolatedLoads*

This parameter gets the number of isolated loads.

*Parameter 3: Topology.First*

This parameter sets the first branch active, returns 0 if none.

*Parameter 4: Topology.Next*

This parameter sets the next branch active, returns 0 if none.

*Parameter 5: Topology.ActiveBranch*

This parameter returns the index of the active Branch.

*Parameter 6: Topology.ForwardBranch*

This parameter move forward in the tree, return index of new active branch or 0 if no more.

*Parameter 7: Topology.BackwardBranch*

This parameter move back toward the source, return index of new active branch or 0 if no more.

*Parameter 8: Topology.LoopedBranch*

This parameter move to looped branch, return index or 0 if none.

*Parameter 9: Topology.ParallelBranch*

This parameter mode to directly parallel branch, return index or 0 if none.

*Parameter 10: Topology.FirstLoad*

This parameter sets as active load the first load at the active branch, return index or 0 if none.

*Parameter 11: Topology.NextLoad*

This parameter sets as active load the next load at the active branch, return index or 0 if none.

*Parameter 12: Topology.ActiveLevel*

This parameter gets the topological depth of the active branch.

## TolopolgyS (String) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr TopologyS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable *Parameter*, which can be one of the following:

*Parameter 0: Topology.BranchName read*

This parameter gets the name of the active branch.

*Parameter 1: Topology.BranchName write*

This parameter sets the name of the active branch.

*Parameter 2: Topology.BusName read*

This parameter gets the name of the active Bus.

*Parameter 3: Topology.BusName write*

This parameter sets the Bus active by name.

## TolopolgyV (Variant) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void TopologyV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable *Parameter*, which can be one of the following:

*Parameter 0: Topology.AllLoopedPairs*

This parameter gets a variant array of all looped element names, by pairs.

*Parameter 1: Topology.AllIsolatedBranches*

This parameter gets a variant array of all isolated branch names.

*Parameter 2: Topology.AllIsolatedLoads*

This parameter gets a variant array of all isolated load names.

## DSS\_Executive Interface

This interface implements the DSS\_Executive (IDSS\_Executive) interface of OpenDSS by declaring 2 procedures for accessing the different properties included in this interface.

## DSS\_Executivel (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t DSSExecutivel(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Topology.NumCommands*

This parameter gets the number of DSS Executive Commands.

*Parameter 1: Topology.NumOptions*

This parameter gets the number of DSS Executive Options.

## **DSS\_ExecutiveS (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr DSSExecutiveS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Topology.Command*

This parameter gets i-th command (specified in the argument as string).

*Parameter 1: Topology.Option*

This parameter gets i-th option (specified in the argument as string).

*Parameter 2: Topology.CommandHelp*

This parameter gets help string for i-th command (specified in the argument as string).

*Parameter 3: Topology.OptionHelp*

This parameter gets help string for i-th option (specified in the argument as string).

*Parameter 4: Topology.OptionValue*

This parameter gets present value for i-th option (specified in the argument as string).

## **Sensors Interface**

This interface implements the Sensors (ISensors) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

## **SensorsI (Int) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t SensorsI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Sensors.Count*

This parameter gets number of sensors in active circuit.



*Parameter 1: Sensors.First*

This parameter sets the first sensor active. Returns 0 if none.

*Parameter 2: Sensors.Next*

This parameter sets the next sensor active. Returns 0 if none

*Parameter 3: Sensors.IsDelta read*

This parameter returns 1 if the sensor is connected in delta; otherwise, returns 0.

*Parameter 4: Sensors.IsDelta write*

This parameter allows to set 1 if the sensor is connected in delta; otherwise, set 0 (argument).

*Parameter 5: Sensors.ReverseDelta read*

This parameter returns 1 if voltage measurements are 1-3, 3-2, 2-1; otherwise 0.

*Parameter 6: Sensors.ReverseDelta write*

This parameter allows to set 1 if voltage measurements are 1-3, 3-2, 2-1; otherwise 0.

*Parameter 7: Sensors.MeteredTerminal read*

This parameter gets the number of the measured terminal in the measured element.

*Parameter 8: Sensors.MeteredTerminal write*

This parameter sets the number of the measured terminal in the measured element.

*Parameter 9: Sensors.Reset*

This parameter clears the active sensor.

*Parameter 10: Sensors.ResetAll*

This parameter clears all sensors in the active circuit.

## **SensorsF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double SensorsF(int32_t Parameter, double Argument);
```

This interface returns a floating point number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Sensors.PctError read*

This parameter gets the assumed percent error in the Sensor measurement. Default is 1.

*Parameter 1: Sensors.PctError write*

This parameter sets the assumed percent error in the Sensor measurement. Default is 1.

*Parameter 2: Sensors.Weight read*

This parameter gets the weighting factor for this sensor measurement with respect to the other sensors. Default is 1.

*Parameter 3: Sensors.Weight write*

This parameter sets the weighting factor for this sensor measurement with respect to the other sensors. Default is 1.

*Parameter 4: Sensors.kVbase read*

This parameter gets the voltage base for the sensor measurements. LL for 2 and 3 - phase sensors, LN for 1-phase sensors.

*Parameter 5: Sensors.kVbase write*

This parameter sets the voltage base for the sensor measurements. LL for 2 and 3 - phase sensors, LN for 1-phase sensors.

## **SensorsS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr SensorsS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Sensors.Name read*

This parameter gets the name of the active sensor object.

*Parameter 1: Sensors.Name write*

This parameter sets the name of the active sensor object.

*Parameter 2: Sensors.MeteredElement read*

This parameter gets the full name of the measured element.

*Parameter 3: Sensors.MeteredElement write*

This parameter sets the full name of the measured element.

## **SensorsV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void SensorsV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Sensors.AllNames*

This parameter returns a variant array of sensor names.

*Parameter 1: Sensors.Currents read*

This parameter gets an array of doubles for the line current measurements; don't use with KWS and KVARs.

*Parameter 2: Sensors.Currents write*

This parameter sets an array of doubles for the line current measurements; don't use with KWS and KVARs.

*Parameter 3: Sensors.KVARs read*

This parameter gets an array of doubles for Q measurements; overwrites currents with a new estimate using KWS.

*Parameter 4: Sensors.KVARs write*

This parameter sets an array of doubles for Q measurements; overwrites currents with a new estimate using KWS.

*Parameter 5: Sensors.KWS read*

This parameter gets an array of doubles for P measurements; overwrites currents with a new estimate using KVARs.

*Parameter 6: Sensors.KWS write*

This parameter sets an array of doubles for P measurements; overwrites currents with a new estimate using KVARs.

## XYCurves Interface

This interface implements the XYCurves (IXYCurves) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### XYCurvesI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t XYCurvesI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: XYCurves.Count*

This parameter gets number of XYCurves in active circuit.

*Parameter 1: XYCurves.First*

This parameter sets first XYCurves object active; returns 0 if none.

*Parameter 2: XYCurves.Next*

This parameter sets next XYCurves object active; returns 0 if none.

*Parameter 3: XYCurves.Npts read*

This parameter gets the number of points in X-Y curve.

*Parameter 4: XYCurves.Npts read*

This parameter sets the number of points in X-Y curve.

### XYCurvesF (Float) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double XYCurvesF(int32_t Parameter, double Argument);
```

This interface returns a floating point number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: XYCurves.X read*

This parameter gets the interpolated value after setting Y.

*Parameter 1: XYCurves.X write*

This parameter sets the X value.

*Parameter 2: XYCurves.Y read*

This parameter gets the interpolated value after setting X.

*Parameter 3: XYCurves.Y write*

This parameter sets the Y value.

*Parameter 4: XYCurves.XShift read*

This parameter gets the amount to shift X value from original curve.

*Parameter 5: XYCurves.XShift write*

This parameter sets the amount to shift X value from original curve.

*Parameter 6: XYCurves.YShift read*

This parameter gets the amount to shift Y value from original curve.

*Parameter 7: XYCurves.YShift write*

This parameter sets the amount to shift Y value from original curve.

*Parameter 8: XYCurves.XScale read*

This parameter gets the factor to scale X values from original curve.

*Parameter 9: XYCurves.XScale write*

This parameter sets the factor to scale X values from original curve.

*Parameter 10: XYCurves.YScale read*

This parameter gets the factor to scale Y values from original curve.

*Parameter 11: XYCurves.YScale write*

This parameter sets the factor to scale Y values from original curve.

## **XYCurvesS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr XYCurvesS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: XYCurves.Name read*

This parameter gets the name of the active XYCurve Object.

*Parameter 1: XYCurves.Name write*

This parameter sets the name of the active XYCurve Object.

## **XYCurvesV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void XYCurvesS(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable *Parameter*, which can be one of the following:

*Parameter 0: XYCurves.XArray read*

This parameter gets the X values as a variant array of doubles. Set *Npts* to max number expected if setting.

*Parameter 1: XYCurves.XArray write*

This parameter sets the X values as a variant array of doubles specified in *Argument*. Set *Npts* to max number expected if setting.

*Parameter 2: XYCurves.YArray read*

This parameter gets the Y values as a variant array of doubles. Set *Npts* to max number expected if setting.

*Parameter 3: XYCurves.YArray write*

This parameter sets the Y values as a variant array of doubles specified in *Argument*. Set *Npts* to max number expected if setting

## PDElements Interface

This interface implements the PDElements (IPDElements) interface of OpenDSS by declaring 3 procedures for accessing the different properties included in this interface.

### PDElementsI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t PDElementsI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable *Parameter*, which can be one of the following:

*Parameter 0: PDElements.Count*

This parameter gets number of PDElements in active circuit.

*Parameter 1: PDElements.First*

This parameter sets the first enabled PD element to be the active element. Returns 0 if none found.

*Parameter 2: PDElements.Next*

This parameter sets the next enabled PD element to be the active element. Returns 0 if none found.

*Parameter 3: PDElements.IsShunt*

This parameter returns 1 if the PD element should be treated as a shunt element rather than a series element. Applies to capacitor and reactor elements in particular.

*Parameter 4: PDElements.NumCustomers*

This parameter gets the number of customers in this branch.

*Parameter 5: PDElements.TotalCustomers*

This parameter gets the total number of customers from this branch to the end of the zone.

*Parameter 6: PDElements.ParentPDElement*

This parameter gets the parent PD element to be the active circuit element. Returns 0 if no more elements upline.

*Parameter 7: PDElements.FromTerminal*

This parameter gets the number of the terminal of active PD element that is on the "from" side. This is set after the meter zone is determined.

*Parameter 8: PDElements.SectionID*

This parameter gets the integer ID of the feeder section that this PDElement branch is part of.

## **PDElementsF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double PDElementsF(int32_t Parameter, double Argument);
```

This interface returns a floating point number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: PDElements.FaultRate read*

This parameter gets the number of failures per year. For LINE elements: Number of failures per unit length per year.

*Parameter 1: PDElements.FaultRate write*

This parameter sets the number of failures per year. For LINE elements: Number of failures per unit length per year.

*Parameter 2: PDElements.PctPermanent read*

This parameter gets the percent of faults that are permanent (require repair). Otherwise, fault is assumed to be transient/temporary.

*Parameter 3: PDElements.PctPermanent write*

This parameter sets the percent of faults that are permanent (require repair). Otherwise, fault is assumed to be transient/temporary.

*Parameter 4: PDElements.Lambda*

This parameter gets the failure rate for this branch. Faults per year including length of line.

*Parameter 5: PDElements.AccumulatedL*

This parameter gets the accumulated failure rate for this branch on down line.

*Parameter 6: PDElements.RepairTime*

This parameter gets the average time to repair a permanent fault on this branch, hours.

*Parameter 7: PDElements.TotalMiles*

This parameter gets the total miles of line from this element to the end of the zone. For recloser siting algorithm.

## **PDElementsS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

`CStr PDElementsF(int32_t Parameter, CStr Argument);`

This interface returns a string with the result of the query according to the value of the variable `Parameter`, which can be one of the following:

*Parameter 0: PDElements.Name read*

This parameter gets the name of the active PDElement, returns null string if active element id not PDElement.

*Parameter 1: PDElements.Name write*

This parameter sets the name of the active PDElement, returns null string if active element id not PDElement.

## Reclosers Interface

This interface implements the Reclosers (IReclosers) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### ReclosersI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

`int32_t ReclosersI(int32_t Parameter, int32_t Argument);`

This interface returns an integer with the result of the query according to the value of the variable `Parameter`, which can be one of the following:

*Parameter 0: Reclosers.Count*

This parameter gets number of Reclosers in active circuit.

*Parameter 1: Reclosers.First*

This parameter sets first recloser to be active Circuit Element. Returns 0 if none.

*Parameter 2: Reclosers.Next*

This parameter sets next recloser to be active Circuit Element. Returns 0 if none.

*Parameter 3: Reclosers.MonitoredTerm read*

This parameter gets the terminal number of Monitored Object for the Recloser.

*Parameter 4: Reclosers.MonitoredTerm write*

This parameter sets the terminal number of Monitored Object for the Recloser.

*Parameter 5: Reclosers.SwitchedTerm read*

This parameter gets the terminal of the controlled device being switched by the Recloser.

*Parameter 6: Reclosers.SwitchedTerm write*

This parameter sets the terminal of the controlled device being switched by the Recloser.

*Parameter 7: Reclosers.NumFast read*

This parameter gets the number of fast shots.

*Parameter 8: Reclosers.NumFast write*

This parameter sets the number of fast shots.

*Parameter 9: Reclosers.Shots read*

This parameter gets the number of shots to lockout (fast + delayed).

*Parameter 10: Reclosers.Shots write*

This parameter sets the number of shots to lockout (fast + delayed).

*Parameter 11: Reclosers.Open*

This parameter open recloser's controlled element and lock out the recloser.

*Parameter 12: Reclosers.Close*

This parameter close the switched object controlled by the recloser. Resets recloser to first operation.

*Parameter 13: Reclosers.Idx read*

This parameter gets the active recloser by index into the recloser list. 1..Count.

*Parameter 14: Reclosers.Idx write*

This parameter sets the active recloser by index into the recloser list. 1..Count.

## **ReclosersF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double ReclosersF(int32_t Parameter, double Argument);
```

This interface returns a floating point number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Reclosers.PhaseTrip read*

This parameter gets the phase trip curve multiplier or actual amps.

*Parameter 1: Reclosers.PhaseTrip write*

This parameter sets the phase trip curve multiplier or actual amps.

*Parameter 2: Reclosers.PhaseInst read*

This parameter gets the phase instantaneous curve multiplier or actual amps.

*Parameter 3: Reclosers.PhaseInst write*

This parameter sets the phase instantaneous curve multiplier or actual amps.

*Parameter 4: Reclosers.GroundTrip read*

This parameter gets the ground (3I0) trip multiplier or actual amps.

*Parameter 5: Reclosers.GroundTrip write*

This parameter sets the ground (3I0) trip multiplier or actual amps.

*Parameter 6: Reclosers.GroundInst read*

This parameter gets the ground (3I0) instantaneous trip setting - curve multiplier or actual amps.

*Parameter 7: Reclosers.GroundInst write*

This parameter sets the ground (3I0) instantaneous trip setting - curve multiplier or actual amps.



## ReclosersS (String) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr ReclosersS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable *Parameter*, which can be one of the following:

*Parameter 0: Reclosers.Name read*

This parameter gets the name of the active Recloser Object.

*Parameter 1: Reclosers.Name write*

This parameter sets the name of the active Recloser Object.

*Parameter 2: Reclosers.MonitoredObj read*

This parameter gets the full name of object this Recloser is monitoring.

*Parameter 3: Reclosers.MonitoredObj write*

This parameter sets the full name of object this Recloser is monitoring.

*Parameter 4: Reclosers.SwitchedObj read*

This parameter gets the full name of the circuit element that is being switched by this Recloser.

*Parameter 5: Reclosers.SwitchedObj write*

This parameter sets the full name of the circuit element that is being switched by this Recloser.

## ReclosersV (Variant) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void ReclosersV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable *Parameter*, which can be one of the following:

*Parameter 0: Reclosers.AllNames*

This parameter gets a variant array of strings with names of all reclosers in active circuit.

*Parameter 1: Reclosers.RecloseIntervals*

This parameter gets a variant array of doubles: reclose intervals (s) between shots.

## Relays Interface

This interface implements the Relays (IRelays) interface of OpenDSS by declaring 3 procedures for accessing the different properties included in this interface.

## RelaysI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t RelaysI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Relays.Count*

This parameter gets number of Relays in active circuit.

*Parameter 1: Relays.First*

This parameter sets first relay active. If none, returns 0.

*Parameter 2: Relays.Next*

This parameter sets next relay active. If none, returns 0.

*Parameter 3: Relays.MonitoredTerm read*

This parameter gets the number of terminal of monitored element that this relay is monitoring.

*Parameter 4: Relays.MonitoredTerm write*

This parameter sets the number of terminal of monitored element that this relay is monitoring.

*Parameter 5: Relays.SwitchedTerm read*

This parameter gets the number of terminal of the switched object that will be opened when the relay trips.

*Parameter 6: Relays.SwitchedTerm write*

This parameter sets the number of terminal of the switched object that will be opened when the relay trips.

*Parameter 7: Relays.Idx read*

This parameter gets the active relay by index into the Relay list. 1..Count.

*Parameter 8: Relays.Idx write*

This parameter sets the active relay by index into the Relay list. 1..Count.

## **RelaysS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr RelaysS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Relays.Name read*

This parameter gets the name of the active Relay.

*Parameter 1: Relays.Name write*

This parameter sets the name of the active Relay.

*Parameter 2: Relays.MonitoredObj read*

This parameter gets the full name of the object this relay is monitoring.

*Parameter 3: Relays.MonitoredObj write*

This parameter sets the full name of the object this relay is monitoring.

*Parameter 4: Relays.SwitchedObj read*

This parameter gets the full name of element that will be switched when relay trips.

*Parameter 5: Relays.SwitchedObj write*

This parameter sets the full name of element that will be switched when relay trips.

## **RelaysV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void RelaysV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Relays.AllNames*

This parameter gets a variant array of strings containing names of all relay elements.

## **CmathLib Interface**

This interface implements the CmathLib (ICmathLib) interface of OpenDSS by declaring 2 procedures for accessing the different properties included in this interface.

## **CmathLibF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double CmathLibF(int32_t Parameter, double Argument1, double Argument2);
```

This interface returns a floating point number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: CmathLib.Cabs*

This parameter returns the absolute value of complex number given in real (Argument1) and imaginary (Argument2) doubles.

*Parameter 1: CmathLib.Cdang*

This parameter returns the angle, in degrees, of a complex number specified as two doubles: Real part (Argument1) and imaginary part (Argument2).

## **CmathLibV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void CmathLibV(int32_t Parameter, double Argument1, double Argument2, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: CmathLib.cmplx*

This parameter convert real (Argument1) and imaginary (Argument1) doubles to variant array of doubles.

*Parameter 1: CmathLib.ctopolardeg*

This parameter convert complex number (Argument1 and Argument2) to magnitude and angle, degrees. Returns variant array of two doubles.

*Parameter 2: CmathLib.pdegtocomplex*

This parameter convert magnitude, angle in degrees (Argument1 and Argument2) to a complex number. Returns variant array of two doubles.

## Parser Interface

This interface implements the CmathLib (ICmathLib) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### ParserI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t ParserI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Parser.IntValue*

This parameter return next parameter as a long integer.

*Parameter 1: Parser.ResetDelimiters*

This parameter reset delimiters to their default values.

*Parameter 2: Parser.AutoIncrement read*

In this parameter the default is false (0). If true (1) parser automatically advances to next token after DbIValue, IntValue, or StrValue. Simpler when you don't need to check for parameter names.

*Parameter 3: Parser.AutoIncrement read*

In this parameter the default is false (0). If true (1) parser automatically advances to next token after DbIValue, IntValue, or StrValue. Simpler when you don't need to check for parameter names.

### ParserF (Float) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double ParserF(int32_t Parameter, double Argument);
```

This interface returns a floating point number with the result of the query according to the value of the variable *Parameter*, which can be one of the following:

*Parameter 0: Parser.DblValue*

This parameter returns next parameter as a double.

## **ParserS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr ParserS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable *Parameter*, which can be one of the following:

*Parameter 0: Parser.CmdString read*

This parameter gets a string to be parsed. Loading this string resets the parser to the beginning of the line. Then parse off the tokens in sequence.

*Parameter 1: Parser.CmdString write*

This parameter sets a string to be parsed. Loading this string resets the parser to the beginning of the line. Then parse off the tokens in sequence.

*Parameter 2: Parser.NextParam*

This parameter gets next token and return tag name (before = sign) if any. See Autoincrement.

*Parameter 3: Parser.StrValue*

This parameter return next parameter as a string.

*Parameter 4: Parser.WhiteSpace read*

This parameter gets the characters used for White space in the command string. Default in blank and Tab.

*Parameter 5: Parser.WhiteSpace write*

This parameter sets the characters used for White space in the command string. Default in blank and Tab.

*Parameter 6: Parser.BeginQuote read*

This parameter gets the string containing the characters for quoting in OpenDSS scripts. Matching pairs defined in EndQuote. Default is "{[{".

*Parameter 7: Parser.BeginQuote write*

This parameter sets the string containing the characters for quoting in OpenDSS scripts. Matching pairs defined in EndQuote. Default is "{[{".

*Parameter 8: Parser.EndQuote read*

This parameter gets the string containing the characters, in order, that match the beginning quote characters in BeginQuote. Default is "]}".

*Parameter 9: Parser.EndQuote write*

This parameter sets the string containing the characters, in order, that match the beginning quote characters in BeginQuote. Default is "]}".

*Parameter 10: Parser.Delimiters read*

This parameter gets the string defining hard delimiters used to separate token on the command string. Default is , and =. The = separates token name from token value. These override whitespace to separate tokens.

*Parameter 11: Parser.Delimiters write*

This parameter sets the string defining hard delimiters used to separate token on the command string. Default is , and =. The = separates token name from token value. These override whitespace to separate tokens.

## **ParserV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void ParserV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Parser.Vector*

This parameter returns token as variant array of doubles. For parsing quoted array syntax.

*Parameter 1: Parser.Matrix*

Use this property to parse a Matrix token in OpenDSS format. Returns square matrix of order specified. Order same as default fortran order: column by column.

*Parameter 2: Parser.SymMatrix*

Use this property to parse a Matrix token in lower triangular form. Symmetry is forced.

## **LoadShapes Interface**

This interface implements the LoadShape (ILoadShape) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

## **LoadShapel (Int) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t LoadShapel(int32_t Parameter, int32_t Argument);
```

This interface returns an integer number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: LoadShapes.Count*

This parameter returns the number of LoadShape objects currently defined in LoadShape collection.

*Parameter 1: LoadShapes.First*

This parameter sets the first loadshape active and return integer index of the loadshape. Returns 0 if no more.

*Parameter 2: LoadShapes.Next*

This parameter sets the next loadshape active and return integer index of the loadshape. Returns 0 if no more.

*Parameter 3: LoadShapes.Npts read*

This parameter gets the number of points in active LoadShape.

*Parameter 4: LoadShapes.Npts write*

This parameter sets the number of points in active LoadShape.

*Parameter 5: LoadShapes.Normalize*

This parameter normalizes the P and Q curves based on either Pbase, Qbase or simply the peak value of the curve.

*Parameter 6: LoadShapes.UseActual read*

This parameter gets a TRUE/FALSE (1/0) to let Loads know to use the actual value in the curve rather than use the value as a multiplier.

*Parameter 7: LoadShapes.UseActual write*

This parameter sets a TRUE/FALSE (1/0 - Argument) to let Loads know to use the actual value in the curve rather than use the value as a multiplier.

## **LoadShapeF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double LoadShapeF(int32_t Parameter, double Argument);
```

This interface returns a floating point number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: LoadShapes.HrInterval read*

This parameter gets the fixed interval time value, hours.

*Parameter 1: LoadShapes.HrInterval write*

This parameter sets the fixed interval time value, hours.

*Parameter 2: LoadShapes.MinInterval read*

This parameter gets the fixed interval time value, in minutes.

*Parameter 3: LoadShapes.MinInterval write*

This parameter sets the fixed interval time value, in minutes.

*Parameter 4: LoadShapes.PBase read*

This parameter gets the base for normalizing P curve. If left at zero, the peak value is used.

*Parameter 5: LoadShapes.PBase write*

This parameter sets the base for normalizing P curve. If left at zero, the peak value is used.

*Parameter 6: LoadShapes.QBase read*

This parameter gets the base for normalizing Q curve. If left at zero, the peak value is used.

*Parameter 7: LoadShapes.QBase write*

This parameter sets the base for normalizing Q curve. If left at zero, the peak value is used.

*Parameter 8: LoadShapes.Sinterval read*

This parameter gets the fixed interval data time interval, seconds.

*Parameter 9: LoadShapes.Sinterval write*

This parameter sets the fixed interval data time interval, seconds.

## **LoadShapeS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr LoadShapeS(int32_t Parameter, CStr Argument);
```

This interface returns string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: LoadShapes.Name read*

This parameter gets the name of the active LoadShape object.

*Parameter 1: LoadShapes.Name write*

This parameter sets the name of the active LoadShape object.

## **LoadShapeV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void LoadShapeV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: LoadShapes.AllNames*

This parameter gets a variant array of strings containing names of all LoadShape objects currently defined.

*Parameter 1: LoadShapes.PMult read*

This parameter gets a variant array of doubles for the P multiplier in the LoadShape.

*Parameter 2: LoadShapes.PMult write*

This parameter sets a variant array of doubles for the P multiplier in the LoadShape.

*Parameter 3: LoadShapes.QMult read*

This parameter gets a variant array of doubles for the Q multiplier in the LoadShape.

*Parameter 4: LoadShapes.QMult write*

This parameter sets a variant array of doubles for the Q multiplier in the LoadShape.

*Parameter 5: LoadShapes.TimeArray read*

This parameter gets a time array in hours corresponding to P and Q multipliers when the Interval = 0.



*Parameter 6: LoadShapes.TimeArray write*

This parameter sets a time array in hours corresponding to P and Q multipliers when the Interval = 0.

## Fuses Interface

This interface implements the Fuses (IFuses) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### FusesI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t FusesI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Fuses.Count*

This parameter returns the number of Fuses objects currently defined in the active circuit.

*Parameter 1: Fuses.First*

This parameter sets the first Fuse to be the active Fuse. Returns 0 if none.

*Parameter 2: Fuses.Next*

This parameter sets the next Fuse to be the active Fuse. Returns 0 if none.

*Parameter 3: Fuses.MonitoredTerm read*

This parameter gets the terminal number to switch the fuse is connected.

*Parameter 4: Fuses.MonitoredTerm write*

This parameter sets the terminal number to switch the fuse is connected.

*Parameter 5: Fuses.SwitchedTerm read*

This parameter gets the terminal number of the terminal containing the switch controlled by the fuse.

*Parameter 6: Fuses.SwitchedTerm write*

This parameter sets the terminal number of the terminal containing the switch controlled by the fuse.

*Parameter 7: Fuses.Open*

Manual opening of fuse.

*Parameter 8: Fuses.Close*

Manual closing of fuse.

*Parameter 9: Fuses.IsBlown*

This parameter returns the current state of the fuses. TRUE (1) if any on any phase is blown. Else FALSE (0).

*Parameter 10: Fuses.Idx read*

This parameter gets the active fuse by index into the list of fuses. 1 based: 1..count.

*Parameter 11: Fuses.Idx write*

This parameter sets the active fuse by index into the list of fuses. 1 based: 1..count.

*Parameter 12: Fuses.NumPhases*

This parameter gets the number of phases of the active fuse.

## **FusesF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double FusesF(int32_t Parameter, double Argument);
```

This interface returns a floating point number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Fuses.RatedCurrent read*

This parameter gets the multiplier or actual amps for the TCCcurve object. Defaults to 1.0, Multiply current values of TCC curve by this to get actual amps.

*Parameter 1: Fuses.RatedCurrent write*

This parameter sets the multiplier or actual amps for the TCCcurve object. Defaults to 1.0, Multiply current values of TCC curve by this to get actual amps.

*Parameter 2: Fuses.Delay read*

This parameter gets the fixed delay time in seconds added to the fuse blowing time determined by the TCC curve. Default is 0.

*Parameter 3: Fuses.Delay write*

This parameter sets the fixed delay time in seconds added to the fuse blowing time determined by the TCC curve. Default is 0.

## **FusesS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr FusesS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Fuses.Name read*

This parameter gets the name of the active fuse.

*Parameter 1: Fuses.Name write*

This parameter sets the name of the active fuse.

*Parameter 2: Fuses.MonitoredObj read*

This parameter gets the name of the Monitored Object by the active fuse.

*Parameter 3: Fuses.MonitoredObj write*

This parameter sets the name of the Monitored Object by the active fuse.

*Parameter 4: Fuses.SwitchedObj read*

This parameter gets the full name of the circuit element switch that the fuse controls. Defaults to the MonitoredObj.

*Parameter 5: Fuses.SwitchedObj write*

This parameter sets the full name of the circuit element switch that the fuse controls. Defaults to the MonitoredObj.

*Parameter 6: Fuses.TCCcurve read*

This parameter gets the name of the TCCcurve object that determines fuse blowing.

*Parameter 7: Fuses.TCCcurve write*

This parameter sets the name of the TCCcurve object that determines fuse blowing.

## **FusesV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void FusesV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Fuses.AllNames*

This parameter gets the variant array of string containing names of all fuses in the circuit.

## **ISources Interface**

This interface implements the ISources (IIsources) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

## **ISourcesI (Int) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t ISourcesI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: ISources.Count*

This parameter returns the number of ISource objects currently defined in the active circuit.

*Parameter 1: ISources.First*

This parameter sets the first ISource to be active; returns 0 if none.

*Parameter 2: Isources.Next*

This parameter sets the next ISource to be active; returns 0 if none.

## **IsourcesF (Float) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double IsourcesF(int32_t Parameter, double Argument);
```

This interface returns a floating point number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Isources.Amps read*

This parameter gets the magnitude of the Isource in Amps.

*Parameter 1: Isources.Amps write*

This parameter sets the magnitude of the Isource in Amps.

*Parameter 2: Isources.AngleDeg read*

This parameter gets the phase angle of the Isource in degrees.

*Parameter 3: Isources.AngleDeg write*

This parameter sets the phase angle of the Isource in degrees.

*Parameter 4: Isources.Frequency read*

This parameter gets the frequency of the Isource in Hz.

*Parameter 5: Isources.Frequency write*

This parameter sets the frequency of the Isource in Hz.

## **IsourcesS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr IsourcesS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Isources.Name read*

This parameter gets the name of the active Isource object.

*Parameter 1: Isources.Name write*

This parameter sets the name of the active Isource object.

## **IsourcesV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void IsourcesV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: Isources.AllNames*

This parameter gets the variant array of string containing names of all ISources in the circuit.

## PVsystems Interface

This interface implements the PVSystems (IPVSystems) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### PVSystemsI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t PVSystemsI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: PVSystems.Count*

This parameter returns the number of PVSystem objects currently defined in the active circuit.

*Parameter 1: PVSystems.First*

This parameter sets the first PVSystem to be active; returns 0 if none.

*Parameter 2: PVSystems.Next*

This parameter sets the next PVSystem to be active; returns 0 if none.

*Parameter 3: PVSystems.Idx read*

This parameter gets the active PVSystem by index; 1..Count.

*Parameter 4: PVSystems.Idx write*

This parameter sets the active PVSystem by index; 1..Count.

### PVSystemsF (Float) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double PVSystemsF(int32_t Parameter, double Argument);
```

This interface returns a floating point number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: PVSystems.Irradiance read*

This parameter gets the present value of the Irradiance property in W/sq-m.

*Parameter 1: PVSystems.Irradiance write*

This parameter sets the present value of the Irradiance property in W/sq-m.

*Parameter 2: PVSystems.kW*

This parameter gets the kW output.

*Parameter 3: PVSystems.kvar read*

This parameter gets the kvar value.

*Parameter 4: PVSystems.kvar write*

This parameter sets the kvar value.

*Parameter 5: PVSystems.pf read*

This parameter gets the power factor value.

*Parameter 6: PVSystems.pf write*

This parameter sets the power factor value.

*Parameter 7: PVSystems.KVARated read*

This parameter gets the rated kVA of the PVSystem.

*Parameter 8: PVSystems.KVARated write*

This parameter sets the rated kVA of the PVSystem.

## **PVSystemsS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr PVSystemsS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: PVSystems.Name read*

This parameter gets the name of the active PVSystem.

*Parameter 1: PVSystems.Name write*

This parameter sets the name of the active PVSystem.

## **PVSystemsV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void PVSystemsV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: PVSystems.AllNames*

This parameter gets the variant array of string containing names of all PVSystems in the circuit.

## VSources Interface

This interface implements the Vsources (IVSources) interface of OpenDSS by declaring 4 procedures for accessing the different properties included in this interface.

### VSourcesI (Int) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
int32_t VSourcesI(int32_t Parameter, int32_t Argument);
```

This interface returns an integer number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: VSources.Count*

This parameter returns the number of VSource objects currently defined in the active circuit.

*Parameter 1: VSources.First*

This parameter sets the first VSource to be active; returns 0 if none.

*Parameter 2: VSources.Next*

This parameter sets the next VSource to be active; returns 0 if none.

*Parameter 3: VSources.Phases read*

This parameter gets the number of phases of the active VSource.

*Parameter 4: VSources.Phases write*

This parameter sets the number of phases of the active VSource.

### VSourcesF (Float) Interface

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
double VSourcesF(int32_t Parameter, double Argument);
```

This interface returns a floating point number with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: VSources.BasekV read*

This parameter gets the source voltage in kV.

*Parameter 1: VSources.BasekV write*

This parameter sets the source voltage in kV.

*Parameter 2: VSources.pu read*

This parameter gets the source voltage in pu.

*Parameter 3: VSources.pu write*

This parameter sets the source voltage in pu.

*Parameter 4: VSources.Angleddeg read*

This parameter gets the source phase angle of first phase in degrees.

*Parameter 5: VSources.Angleddeg write*

This parameter sets the source phase angle of first phase in degrees.

*Parameter 6: VSources.Frequency read*

This parameter gets the source frequency in Hz.

*Parameter 7: VSources.Frequency write*

This parameter sets the source frequency in Hz.

## **VSourcesS (String) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
CStr VSourcesS(int32_t Parameter, CStr Argument);
```

This interface returns a string with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: VSources.Name read*

This parameter gets the name of the active VSource.

*Parameter 1: VSources.Name write*

This parameter sets the name of the active VSource.

## **VSourcesV (Variant) Interface**

This interface can be used to read/write certain properties of the active DSS object. The structure of the interface is as follows:

```
void VSourcesV(int32_t Parameter, VARIANT *Argument);
```

This interface returns a Variant with the result of the query according to the value of the variable Parameter, which can be one of the following:

*Parameter 0: VSources.AllNames*

This parameter gets the name of the active VSource.

## **Alternative Interfaces**

These interfaces were made to cover particular requests and can be available in future versions of this DLL. The structure of these interfaces can be different from the rest of the interfaces proposed above.

## **InitAndGetYparams Interface**



This interface initializes the YMatrix of the system in case of being necessary. It must be executed before executing the interface *GetCompressedYMatrix* to reduce the possibility of errors. The structure of this interface is as follows:

```
UInt32 InitAndGetYparams(uint32 hY, uint32 nBus, uint32 nNZ);
```

## **GetCompressedYMatrix Interface**

This interface gets the YMatrix of the system in a reduced format by delivering the pointers of row, column and matrix values. The structure of this interface is as follows:

```
Void GetCompressedYMatrix(uint32 hY, uint32 nBus, uint32 nNz, uint32 ColPtr, uint32 RowIdx,  
uint32 cVals);
```

## **ZeroInjCurr Interface**

This interface commands to OpenDSS to initialize currents vector as an array of zeros, which is basically the first step in the solution algorithm (DoNormalSolution routine). The structure of this interface is as follows:

```
Void ZeroInjCurr();
```

## **GetSourceInjCurrents Interface**

This interface commands to OpenDSS to include the currents injected by voltage/current sources into the currents vector, following the procedure proposed in the solution algorithm (DoNormalSolution routine). The structure of this interface is as follows:

```
Void GetSourceInjCurrents();
```

## **GetPCInjCurr Interface**

This interface commands to OpenDSS to include the currents injected by the power conversion devices into the currents vector, following the procedure proposed in the solution algorithm (DoNormalSolution routine). The structure of this interface is as follows:

```
Void GetPCInjCurr ();
```

## **SystemYChanged Interface**

This interface reads/writes the variable *SystemYChanged* (Boolean), which is used in the DoNormalSolution routine. Using this variable the Y matrix will be recalculated for the next solution iteration. The structure of this interface is as follows:

Int32 SystemYChanged (int32 parameter, int32 argument);

Depending on the value provided in the variable *parameter*, this interface will deliver the current value of *SystemYChanged* or will set the value specified in the variable *argument*.

*Parameter 0: SystemYChanged read*

The interface will deliver the value of the variable *SystemYChanged* (1=True, 0=False)

*Parameter 1: SystemYChanged write*

The interface will set the value of the variable *SystemYChanged* using the numeric value provided in the variable *argument* (1=True, 0=False).

## BuildYMatrixD Interface

This interface executes the procedure BuildYMatrix, which is used in the DoNormalSolution routine to rebuild the Y Matrix. The structure of this interface is as follows:

void BuildYMatrixD (int32 BuildOps, int32 AllocateVI);

The values of BuildOps (SERIESONLY=1, WHOLEMATRIX=2) and AllocateVI (TRUE=1, FALSE=0) will have the same effects and interpretation of the function implemented within the OpenDSS code.

## UseAuxCurrents Interface

This interface reads/writes the variable *UseAuxCurrents* (Boolean), which is used in the DoNormalSolution routine. The structure of this interface is as follows:

Int32 UseAuxCurrents (int32 parameter, int32 argument);

Depending on the value provided in the variable *parameter*, this interface will deliver the current value of *UseAuxCurrents* or will set the value specified in the variable *argument*.

*Parameter 0: UseAuxCurrents read*

The interface will deliver the value of the variable *UseAuxCurrents* (1=True, 0=False)

*Parameter 1: UseAuxCurrents write*

The interface will set the value of the variable *UseAuxCurrents* using the numeric value provided in the variable *argument* (1=True, 0=False).

## AddInAuxCurrents Interface

This interface executes the procedure AddInAuxCurrents, which is used in the DoNormalSolution routine to rebuild the Y Matrix. The structure of this interface is as follows:

void AddInAuxCurrents (int32 SType);

The value of SType (NEWTONSOLVE=1, NORMALSOLVE=0) will have the same effects and interpretation of the function implemented within the OpenDSS code.

## **getIpointer Interface**

This interface delivers the pointer to the vector of currents used within the solution routine of OpenDSS. The structure of this interface is as follows:

```
void getIpointer (uint32 IVectorPtr);
```

## **getVpointer Interface**

This interface delivers the pointer to the vector of Voltages used within the solution routine of OpenDSS. The structure of this interface is as follows:

```
void getVpointer (uint32 VVectorPtr);
```

## **SolveSystem Interface**

This interface executes the procedure *SolveSystem* used in the solution routine of OpenDSS. The structure of this interface is as follows:

```
void SolveSystem(uint32 VVectorPtr);
```

The variable *VVectorPtr* must contain the pointer to the vector of Voltages provided by the interface *getVpointer*.