

DESS 6 XML Format

Data Import Guide

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Introduction

This guide is intended as an introduction to the DESS 6 XML format for developers intending to write data export modules, typically from GIS, which can be imported in DESS v6.

It does not detail the complete DESS 6 data model. It excludes data which would not typically be exported, or may not be exportable from other software. Excluded data includes reference data such as conductor electrical characteristics, detailed transformer data and load modeling data.

When data is being imported from an external system using the File | Import command in DESS, internal references are allowed to be any text instead of an integer as usually required in normal DESS data, and references to items which are not in the data file are allowed.

For example, a data item referring to a branch would normally require the integer ID of the associated conductor (e.g. `<ConductorRef>42</ConductorRef>`), and a Conductor item with ID 42 would need to be defined elsewhere in the data file. However, when importing data into an existing DESS system, you could write a text description of the conductor type (e.g. `<ConductorRef>556mcm Al 27kV</ConductorRef>`). The reference to the conductor type would be resolved during the import process by asking the user to match the descriptive text to a specific type defined in DESS. In the following specification, samples of data used for import (as opposed to exact DESS XML data) are shown in green.

Overview

The general structure of elements in the DESS 6 XML data is flat with each DESS object as a child of the `<System>` root element (Figure 1). XML elements are used for all objects in DESS and for all object properties. XML attributes are not used. For example a small XML file might be structured as follows (detailed data '...' omitted):

```
<?xml version="1.0"?>
<System>
  <Layer> ... </Layer>
  <Conductor> ... </Conductor>
  <Season> ... </Season>
  <Week> ... </Week>
  <LoadCategory> ... </LoadCategory>
  <Node> ... </Node>
  <Node> ... </Node>
  <Line> ... </Line>
  <Source> ... </Source>
  <Load> ... </Load>
</System>
```

Items shown in gray in Figure 1 are not described in this guide and are generally not required for data import purposes.

Element Name	Parent Element	Description	Notes
System		Root element	
Layer	System	Electrical layer	Must appear before any Node XML elements referencing this layer
Conductor	System	Conductor reference	Must appear before any Line XML elements referencing this item.
TransformerRef	System	Distribution transformer reference	Must appear before any DistTrans XML elements referencing this item.
Season	System	Season definition	Must appear before any LoadCategory or Load referencing this item.
Week	System	Weekday type definition	Must appear before any LoadCategory referencing this item.
LoadComponent	System	Load component definition	Must appear before any LoadCategory referencing this item.
LoadCategory	System	Load category definition	Must appear before any Load referencing this item.
ProtectionRef	System	Protection item reference	Must appear before any Protection XML elements referencing this item.
Node	System	Node object (i.e. point, bus, vertex)	Must appear before any Line XML element or any DESS element (Switch, DistTrans, etc) referencing this item.
Line	System	Line object (connects two Node objects)	
Source	System	System source object (fixed voltage supply)	
Switch	System	Switch object (openable)	
PowerTrans	System	Power transformer (connects 2 voltage layers)	
DistTrans	System	Distribution transformer (end user load transformer)	
Load	System	Load (end user energy sink)	
Capacitor	System	Capacitor bank	
MotorGen	System	Motor or generator (synchronous or	

Element Name	Parent Element	Description	Notes
		induction)	
Regulator	System	Voltage regulator	
Reactor	System	Series reactor	
Protection	System	Protection element (fuse or relay)	
SystemData	System	System settings	

Figure 1: Overall XML data element structure (Gray - not described in this guide).

XML Element Definitions

Layer Element

This element describes an electrical layer in DESS

Elements Referenced:	-
Referenced by Elements:	Node

SubElements

Name	Type	Default	Range	Req	Description
ID	Integer	-	Positive	Y	Unique layer ID referenced by Node XML element.
Description	Text	-	-	N	Automatically assigned by DESS
Voltage	Integer	1000	1-1000000	Y	Nominal layer voltage (V)
Type	Enumeration	FourWire	ThreeWire, FourWire	Y	Three wire or four wire (grounded) voltage layer
Visibility	Enumeration	On	On, Off, Zoom	N	Layer visibility (Zoom - visibility depends on map scale)
MinimumZoom	Single	0	Positive	N	Minimum zoom (Visibility = Zoom)
MaximumZoom	Single	1e9	Positive	N	Maximum zoom (Visibility = Zoom)
Selectable	Boolean	True	True, False	N	Can select items on the layer
Alpha	Integer	255	0-255	N	Layer transparency

Example

```
<Layer>  
  <ID>3</ID>  
  <Voltage>44000</Voltage>  
  <Type>ThreeWire</Type>  
</Layer>
```

Node Element

This element describes a node in DESS. Nodes are point objects, sometimes called busses or vertices in other GIS or analysis systems. In DESS a node exists wherever there is a DESS element (switch, transformer, load, etc), at junctions between lines, at conductor changes or line ends.

Elements Referenced:	Layer
Referenced by Elements:	Line, Source, Switch, PowerTrans, DistTrans, Load, Capacitor, Regulator, Reactor, MotorGen

SubElements

Name	Type	Default	Range	Req	Description
ID	Integer*	-	Positive	Y	Unique node ID. *In DESS this is an integer. For import purposes this may be any unique text.
Name	Text	""	-	N	User assigned name. Often assigned from name of attached switch or transformer
Description	Text	""	-	N	User assigned description. Often used to hold external ID
LayerRef	Integer	-	Positive	Y	ID of Layer containing this node
MapPoint.MapPoint.coordinate	Text	-	x,y pair	Y	Location of point in map coordinate units (e.g. x,y metres or lat/long). Comma separated
MapPoint.MapPoint.Rotation	Single	0	0-360	N	Rotation of map symbol associated with node

Example

```
<Node>
  <ID>10</ID>
  <Name>3-0005</Name>
  <Description> 1195 (Ext ID)</Description>
  <LayerRef>2</LayerRef>
  <MapPoint>
    <MapPoint>
      <coordinate>1533684.766,4668958.4995</coordinate>
      <Rotation>0</Rotation>
    </MapPoint>
  </MapPoint>
</Node>
```

Sample import from external system. Note the non-integer value for layer and node ID.

```
<Node>
```

```
<ID>B456T</ID>
<LayerRef>12470V</LayerRef>
<MapPoint>
  <MapPoint>
    <coordinate>1533684.766,4668958.4995</coordinate>
  </MapPoint>
</MapPoint>
</Node>
```

Line Element

This element describes a line in DESS. A line connects two DESS nodes and contains a particular phasing and conductor type.

Elements Referenced:	Conductor, Node
Referenced by Elements:	-

SubElements

Name	Type	Default	Range	Req	Description
ID	Integer*	0	Positive	N	Unique line ID. *In DESS this is an integer. For import purposes this may be any value.
Node1	Integer*	-	Positive	Y	ID of one end node. Should match the ID element for associated Node element.
Node2	Integer*	-	Positive	Y	ID of other end node. Should match the ID element for associated Node element.
PhLineValue	Enumeration	ABC	A,B,C,AB,B C,AC,ABC	Y	Phasing of line
Length	Single	0	Positive	Y	Length of line (m)
ConductorRef	Integer*	-	Positive	Y	ID of associated Conductor element. For import, this can also be text describing the conductor
MapLine.MapLine.coordinates	Text	-	Set of x,y coordinates	Y	Set of x,y coordinates defining points. There is a comma between the x and y coordinate, and a space between adjacent pairs.

Examples

```
<Line>
  <ID>557</ID>
  <Node1>201</Node1>
  <Node2>186</Node2>
  <PhLineValue>C</PhLineValue>
  <Length>69</Length>
  <ConductorRef>106</ConductorRef>
  <MapLine>
    <MapLine>
      <coordinates>1533791.126,4668112.002 1533821.125,4668107
1533859.8575,4668106.498</coordinates>
    </MapLine>
  </MapLine>
</Line>
```

Sample for import from external system. Note the non-integer values for Node1, Node2 and ConductorRef.

```
<Line>
  <ID>0</ID>
  <Node1>T567</Node1>
  <Node2>N443</Node2>
  <PhLineValue>ABC</PhLineValue>
  <Length>24</Length>
  <ConductorRef>556 A1</ConductorRef>
  <MapLine>
    <MapLine>
      <coordinates>53379.6,66136 53379.1,66112.0</coordinates>
    </MapLine>
  </MapLine>
</Line>
```

Source Element

This element describes a system supply point with a fixed voltage and specified fault impedance.

Elements Referenced:	Node
Referenced by Elements:	-

SubElements

Name	Type	Default	Range	Req	Description
ID	Integer *	0	Positive	N	Unique line ID. *In DESS this is an integer. For import purposes this may be any value.
ParentNode	Integer *	-	Positive	Y	Node containing this source item. Should be the same as ID element of Node element.
Voltage	Integer	1000	1-1000000	Y	Actual supply voltage (V). Usually slightly higher than the nominal voltage.
Angle	Single	0	-360 - 360	N	Source voltage angle (deg). Makes it possible to specify different sources with different angles.
MaxZeroImpR	Double	0	0-100	N	Maximum zero sequence resistance (p.u. on 100MVA)
MaxZeroImpX	Double	0	0-100	N	Maximum zero sequence reactance (p.u. on 100MVA)
MaxPositiveImpR	Double	0	0-100	N	Maximum positive sequence resistance (p.u. on 100MVA)
MaxPositiveImpX	Double	0	0-100	N	Maximum positive sequence reactance (p.u. on 100MVA)
MaxNegativeImpR	Double	0	0-100	N	Maximum negative sequence resistance (p.u. on 100MVA)
MaxNegativeImpX	Double	0	0-100	N	Maximum negative sequence reactance (p.u. on 100MVA)
MinZeroImpR	Double	0	0-100	N	Minimum zero sequence resistance (p.u. on 100MVA)
MinZeroImpX	Double	0	0-100	N	Minimum zero sequence reactance (p.u. on 100MVA)
MinPositiveImpR	Double	0	0-100	N	Minimum positive sequence resistance (p.u. on 100MVA)
MinPositiveImpX	Double	0	0-100	N	Minimum positive sequence reactance (p.u. on 100MVA)
MinNegativeImpR	Double	0	0-100	N	Minimum negative sequence resistance (p.u. on 100MVA)
MinNegativeImpX	Double	0	0-100	N	Minimum negative sequence reactance (p.u. on 100MVA)

Example

```
<Source>
  <ID>1231</ID>
  <ParentNode>1229</ParentNode>
  <Voltage>44000</Voltage>
  <Angle>0</Angle>
  <MaxZeroImpR>0.0014999999966</MaxZeroImpR>
  <MaxZeroImpX>0.02999999932</MaxZeroImpX>
  <MaxPositiveImpR>0.0004999999888</MaxPositiveImpR>
  <MaxPositiveImpX>0.009999999776</MaxPositiveImpX>
  <MaxNegativeImpR>0.0004999999888</MaxNegativeImpR>
  <MaxNegativeImpX>0.009999999776</MaxNegativeImpX>
  <MinZeroImpR>0.0014999999966</MinZeroImpR>
  <MinZeroImpX>0.02999999932</MinZeroImpX>
  <MinPositiveImpR>0.0004999999888</MinPositiveImpR>
  <MinPositiveImpX>0.009999999776</MinPositiveImpX>
  <MinNegativeImpR>0.0004999999888</MinNegativeImpR>
  <MinNegativeImpX>0.009999999776</MinNegativeImpX>
</Source>
```

Switch Element

This element describes a switch that can be opened, closed or partially opened (by phase).

Elements Referenced:	Node
Referenced by Elements:	-

SubElements

Name	Type	Default	Range	Req	Description
ID	Integer*	0	Positive	N	Unique line ID. *In DESS this is an integer. For import purposes this may be any value.
ParentNode	Integer*	-	Positive	Y	Node containing this switch item. Should be the same as ID element of Node element.
PhElementValue	Enumeration	ABC	A,B,C,AB,BC,AC,ABC	Y	Phasing of switch
PhOpenValue	Enumeration	ABC	None,A,B,C,A B,BC,AC,ABC	Y	Phases which are current open

Example

```
<Switch>
  <ID>1174</ID>
  <ParentNode>329</ParentNode>
  <PhElementValue>ABC</PhElementValue>
  <PhOpenValue>ABC</PhOpenValue>
</Switch>
```

PowerTrans Element

This element describes a power transformer, which is a transformer that connects two voltage layers together by referencing a node on each layer. This is opposed to a distribution transformer which is attached to a single voltage layer and represents the low voltage implicitly

Elements Referenced:	Node
Referenced by Elements:	-

SubElements

Name	Type	Def	Range	Req	Description
ID	Integer*	0	Positive	N	Unique line ID. *In DESS this is an integer. For import purposes this may be any value.
ParentNode	Integer*	-	Positive	Y	High voltage node containing this item. Should be the same as ID element of Node element.
PhElementValue	Enumeration	ABC	A,B,C,AB,B C,AC,ABC	Y	Phasing of item
SecondaryNode	Integer*	-	Positive	Y	Low voltage node. Should be the same as ID element of Node element
Winding	Enumeration	YY	YY,YD,DD, DY,YDY,Au to,AutoDT,S ingle,YDmin 30,DYplus30	Y	Connection between windings
Size	Single	1000	0-1000000	Y	Nominal rating (kVA)
PrimarySecondary ImpR	Double	0	0 - 0.75	Y	Transformer resistance (p.u. on rated size)
PrimarySecondary ImpX	Double	.01	0 - 0.75	Y	Transformer reactance (p.u. on rated size)
PrimaryTertiaryImpR	Double	0	0 - 0.75	N	Transformer high - tertiary resistance (p.u. on rated size) - YDY and AutoDT only
PrimaryTertiaryImpX	Double	.01	0 - 0.75	N	Transformer high - tertiary reactance (p.u. on rated size) - YDY and AutoDT only
SecondaryTertiary ImpR	Double	0	0 - 0.75	N	Transformer low - tertiary resistance (p.u. on rated size) - YDY and AutoDT only
SecondaryTertiary ImpX	Double	.01	0 - 0.75	N	Transformer low - tertiary reactance (p.u. on rated size) - YDY and AutoDT only

Name	Type	Def	Range	Req	Description
LossesP	Double	0	0-1000	Y	No load real losses (kW per phase)
LossesQ	Double	0	0-1000	Y	No load reactive losses (kVAr per phase)
IsPrimaryNeutral Grounded	Boolean	No	Yes,No	Y	True if HV neutral is grounded
PrimaryNeutralImpR	Double	0	0-100	N	Grounding resistance (Ohms)
PrimaryNeutralImpX	Double	0	0-100	N	Grounding reactance (Ohms)
IsSecondaryNeutral Grounded	Boolean	No	Yes,No	Y	True if LV neutral is grounded
SecondaryNeutralImpR	Double	0	0-100	N	Grounding resistance (Ohms)
SecondaryNeutralImpX	Double	0	0-100	N	Grounding reactance (Ohms)
IsTertiaryNeutral Grounded	Boolean	No	Yes,No	N	True if tertiary neutral is grounded - 3 winding transformers only
TertiaryNeutralImpR	Double	0	0-100	N	Grounding resistance (Ohms)
TertiaryNeutralImpX	Double	0	0-100	N	Grounding reactance (Ohms)
IsHVTap	Boolean	Yes	Yes,No	N	True if taps are on HV winding
TapStepSize	Single	0.01	0 - 0.2	N	Size of each tap step (p.u.)
MinimumTap	Single	0.8	0.3 - 2	N	Minimum tap position (p.u.)
MaximumTap	Single	1.2	0.3 - 2	N	Maximum tap position (p.u.)
TapPosition	Single	1.0	0.3 - 2	N	Tap position (p.u.)
TapPositionTertiary	Single	1.0	0.3 - 2	N	Tap position - if 3 winding transformer with LV taps (p.u.)
IsAutomatic	Boolean	No	Yes, No	N	True if voltage regulator attached to transformer
RegulatorSetting	Single	1.0	0.5 - 1.7	N	Regulator voltage setting (p.u.) - if automatic taps
RegulatorDeadband	Single	0.02	0 - 0.2	N	Regulator deadband (p.u.) - if automatic taps
IsLineDrop Compensation	Boolean	No	Yes, No	N	True if voltage regulator has line drop voltage compensation
LineDrop CompensationR	Double	0	0 - 0.5	N	Real impedance value for line drop compensation (p.u.)
LineDrop CompensationX	Double	0	0 - 0.5	N	Reactive impedance value for line drop compensation (p.u.)
IsTertiaryVolt	Boolean	No	Yes, No	N	True if tertiary winding has

Name	Type	Def	Range	Req	Description
Regulation					voltage regulation - 3 winding transformer with LV taps only

Example

```

<PowerTrans>
  <ID>1239</ID>
  <ParentNode>1232</ParentNode>
  <PhElementValue>ABC</PhElementValue>
  <SecondaryNode>1235</SecondaryNode>
  <Winding>YD</Winding>
  <Size>750</Size>
  <PrimarySecondaryImpR>0.0020000000949949</PrimarySecondaryImpR>
  <PrimarySecondaryImpX>0.0450000017881393</PrimarySecondaryImpX>
  <PrimaryTertiaryImpR>0</PrimaryTertiaryImpR>
  <PrimaryTertiaryImpX>0</PrimaryTertiaryImpX>
  <SecondaryTertiaryImpR>0</SecondaryTertiaryImpR>
  <SecondaryTertiaryImpX>0</SecondaryTertiaryImpX>
  <LossesP>2</LossesP>
  <LossesQ>6</LossesQ>
  <IsPrimaryNeutralGrounded>False</IsPrimaryNeutralGrounded>
  <PrimaryNeutralImpR>0</PrimaryNeutralImpR>
  <PrimaryNeutralImpX>0</PrimaryNeutralImpX>
  <IsSecondaryNeutralGrounded>False</IsSecondaryNeutralGrounded>
  <SecondaryNeutralImpR>0</SecondaryNeutralImpR>
  <SecondaryNeutralImpX>0</SecondaryNeutralImpX>
  <IsTertiaryNeutralGrounded>True</IsTertiaryNeutralGrounded>
  <TertiaryNeutralImpR>0</TertiaryNeutralImpR>
  <TertiaryNeutralImpX>0</TertiaryNeutralImpX>
  <IsHVTap>True</IsHVTap>
  <TapStepSize>0.01</TapStepSize>
  <MinimumTap>0.9</MinimumTap>
  <MaximumTap>1.1</MaximumTap>
  <TapPosition>1.01</TapPosition>
  <TapPositionTertiary>1</TapPositionTertiary>
  <IsAutomatic>False</IsAutomatic>
  <RegulatorSetting>1</RegulatorSetting>
  <RegulatorDeadband>0.01</RegulatorDeadband>
  <IsLineDropCompensation>False</IsLineDropCompensation>
  <LineDropCompensationR>0</LineDropCompensationR>
  <LineDropCompensationX>0</LineDropCompensationX>
  <IsTertiaryVoltRegulation>False</IsTertiaryVoltRegulation>
</PowerTrans>

```

DistTrans Element

This element describes a distribution transformer. This is a transformer for end loads where the secondary is represented implicitly.

Elements Referenced:	Node, TransformerRef
Referenced by Elements:	-

SubElements

Name	Type	Default	Range	Req	Description
ID	Integer*	0	Positive	N	Unique line ID. *In DESS this is an integer. For import purposes this may be any value.
ParentNode	Integer*	-	Positive	Y	Node containing this switch item. Should be the same as ID element of Node element.
PhElementValue	Enumeration	ABC	A,B,C,AB,BC,AC,ABC	Y	Phasing of switch
Winding	Enumeration	YY	YY,YD,DD,DY,YDY,Auto,AutoDT,Single,YDmin30,DYplus30	Y	Connection between windings. Must be the same as that in TransformerRef unless that is Single.
TransRef	Integer*	-	Positive	Y	Transformer reference. *For import purposes this can be any text description.
TapPosition	Single	1.0	0.3 - 2	N	Tap position - if any, HV tap

Example

```
<DistTrans>
  <ID>1205</ID>
  <ParentNode>1204</ParentNode>
  <PhElementValue>B</PhElementValue>
  <Winding>Single</Winding>
  <TransRef>69</TransRef>
  <TapPosition>1</TapPosition>
</DistTrans>
```

A sample of data used purely for import purposes might be more flexible with a text description instead of an ID for the type of transformer.

```
<DistTrans>
  <ID>1205</ID>
  <ParentNode>B2486</ParentNode>
  <PhElementValue>B</PhElementValue>
  <Winding>Single</Winding>
  <TransRef>50kVA Single-Phase 27kV</TransRef>
</DistTrans>
```

Load Element

This element describes an end-user load on the system.

Elements Referenced:	Node, Category, Season
Referenced by Elements:	-

SubElements

Name	Type	Def	Range	Req	Description
ID	Integer*	0	Positive	N	Unique line ID. *In DESS this is an integer. For import purposes this may be any value.
ParentNode	Integer*	-	Positive	Y	Node containing this switch item. Should be the same as ID element of Node element.
PhElementValue	Enumeration	ABC	A,B,C,AB,BC,AC,ABC	Y	Phasing of switch
Loads. LoadSetCollection. .LoadSet				Y	Represents a single load at given period of the year. See below. There may be one or more of these in a given load element.
Category	Integer*	-	Positive	Y	Load category defining load characteristics and curves. *For import, this can be some form of descriptive text string.
IsPhaseToPhase	Boolean	No	Yes, No	N	True if the load is applied phase to phase, false if phase to neutral (normal)

Loads.LoadSetCollection.LoadSet Element

Name	Type	Def	Range	Req	Description
LoadingA	Single	0	0 - 1e9	Y	Load on phase A (selected units). For kWh, the duration is the length of the specified season.
LoadingB	Single	0	0 - 1e9	Y	Load on phase B (selected units)
LoadingC	Single	0	0 - 1e9	Y	Load on phase C (selected units)
Season	Integer*	-	Positive	Y	The Season that this load applies to.
LoadUnit	Enumeration	kWh	kWh,kVA,kW, Amps	Y	Unit of load
Scaling	Single	1.0	0 - 50	N	Scaling override for load

Example

<Load>

```
<ID>1042</ID>
<ParentNode>250</ParentNode>
<PhElementValue>A</PhElementValue>
<Loads>
  <LoadSetCollection>
    <LoadSet>
      <LoadingA>22676</LoadingA>
      <LoadingB>0</LoadingB>
      <LoadingC>0</LoadingC>
      <Season>1</Season>
      <LoadUnit>kWh</LoadUnit>
      <Scaling>1</Scaling>
    </LoadSet>
  </LoadSetCollection>
</Loads>
<Category>16</Category>
<IsPhaseToPhase>False</IsPhaseToPhase>
</Load>
```

Capacitor Element

This element describes a capacitor bank.

Elements Referenced:	Node
Referenced by Elements:	-

SubElements

Name	Type	Default	Range	Req	Description
ID	Integer*	0	Positive	N	Unique line ID. *In DESS this is an integer. For import purposes this may be any value.
ParentNode	Integer*	-	Positive	Y	Node containing this switch item. Should be the same as ID element of Node element.
PhElementValue	Enumeration	ABC	A,B,C,AB,BC,AC,ABC	Y	Phasing of switch
SizeA	Single	100	0 - 100000	Y	Size of capacitor bank on phase A (kVAr)
SizeB	Single	100	0 - 100000	Y	Size of capacitor bank on phase B (kVAr)
SizeC	Single	100	0 - 100000	Y	Size of capacitor bank on phase C (kVAr)
ControlType	Enumeration	Fixed	Fixed, Time, VAr, PowerFactor, Voltage	N	Type of capacitor control
OnLimit	Single	-	-	N	Limit at which bank is switched on (depends on control type)
OffLimit	Single	-	-	N	Limit at which bank is switched off (depends on control type)

Example

```

<Capacitor>
  <ID>1</ID>
  <ParentNode>1278</ParentNode>
  <PhElementValue>ABC</PhElementValue>
  <SizeA>200</SizeA>
  <SizeB>200</SizeB>
  <SizeC>200</SizeC>
  <ControlType>PowerFactor</ControlType>
  <OnLimit>0.9</OnLimit>
  <OffLimit>1</OffLimit>
</Capacitor>

```

MotorGenElement

This element describes a motor or generator. It can be either synchronous or induction.

Elements Referenced:	Node
Referenced by Elements:	-

SubElements

Name	Type	Default	Range	Req	Description
ID	Integer*	0	Positive	N	Unique line ID. *In DESS this is an integer. For import purposes this may be any value.
ParentNode	Integer*	-	Positive	Y	Node containing this switch item. Should be the same as ID element of Node element.
RatedSize	Single	1000	0 - 2000000	Y	Size of the motor or generator (kVA)
IsMotor	Boolean	Yes	Yes, No	Y	True if motor, false if generator
IsSynchronous	Boolean	No	Yes, No	Y	True if synchronous, false if induction
SubTransientImpR	Double	.02	0 - 100	N	Subtransient resistance (p.u. on size)
SubTransientImpX	Double	.2	0 - 100	N	Subtransient reactance (p.u. on size)
NegativeImpR	Double	0	0 - 100	N	Negative sequence resistance (p.u. on size)
NegativeImpX	Double	0	0 - 100	N	Negative sequence reactance (p.u. on size)
ZeroImpR	Double	0	0 - 100	N	Zero sequence resistance (p.u. on size)
ZeroImpX	Double	0	0 - 100	N	Zero sequence reactance (p.u. on size)
IsGrounded	Boolean	Yes	Yes, No	N	Neutral is grounded
GroundImpR	Double	0	0 - 100	N	Grounding resistance (Ohms)
GroundImpX	Double	0	0 - 100	N	Grounding reactance (Ohms)
PowerP	Double	500	0 - 1000000	Y	Actual power (kW)
PowerQ	Double	0	0 - 1000000	Y	Actual reactive power (kVAr)
MinkVAr	Double	-500	0 - 1000000	N	Minimum reactive power that can be generated(generator), consumed(motor) (kVAr)
MaxkVAr	Double	500	0 - 1000000	N	Maximum reactive power that can be generated (generator), consumed (motor) (kVAr)
Regulator	Single	1.0	0.5 - 2.0	N	Regulator voltage setting

Name	Type	Default	Range	Req	Description
Setting					
Starting CurrentFactor	Single	6	1 - 10	N	Starting current as a multiple of full load current
StartingPower Factor	Single	0.35	0.1 - 1	N	Starting power factor

Example

```

<MotorGen>
  <ID>1254</ID>
  <ParentNode>1251</ParentNode>
  <RatedSize>5500</RatedSize>
  <IsMotor>True</IsMotor>
  <IsSynchronous>True</IsSynchronous>
  <SubTransientImpR>0.00319999992847443</SubTransientImpR>
  <SubTransientImpX>0.159999996423721</SubTransientImpX>
  <NegativeImpR>0.00360000014305115</NegativeImpR>
  <NegativeImpX>0.180000007152557</NegativeImpX>
  <ZeroImpR>0.00340000003576279</ZeroImpR>
  <ZeroImpX>0.170000001788139</ZeroImpX>
  <IsGrounded>False</IsGrounded>
  <GroundImpR>0</GroundImpR>
  <GroundImpX>0</GroundImpX>
  <PowerP>4500</PowerP>
  <PowerQ>600</PowerQ>
  <MinkVAr>-500</MinkVAr>
  <MaxkVAr>1500</MaxkVAr>
  <RegulatorSetting>1</RegulatorSetting>
  <StartingCurrentFactor>6</StartingCurrentFactor>
  <StartingPowerFactor>0.35</StartingPowerFactor>
</MotorGen>

```

Regulator Element

This element describes a voltage regulator.

Elements Referenced:	Node
Referenced by Elements:	-

SubElements

Name	Type	Default	Range	Req	Description
ID	Integer*	0	Positive	N	Unique line ID. *In DESS this is an integer. For import purposes this may be any value.
ParentNode	Integer*	-	Positive	Y	Node containing this switch item. Should be the same as ID element of Node element.
PhElementValue	Enumeration	ABC	A,B,C,AB,BC,AC,ABC	Y	Phasing of switch
Rating	Single	250	0 - 100000	Y	Rated size of regulator (kVA)
PositiveImpR	Double	0	0 - 0.2	N	Regulator positive sequence resistance (p.u. on rated size)
PositiveImpX	Double	0	0 - 0.2	N	Regulator positive sequence reactance (p.u. on rated size)
ZeroImpR	Double	0	0 - 0.2	N	Regulator zero sequence resistance (p.u. on rated size)
ZeroImpX	Double	0	0 - 0.2	N	Regulator zero sequence reactance (p.u. on rated size)
TapStep	Single	0.01	0 - 0.1	N	Tap step size (p.u.)
MaxTap	Single	1.2	0.3 - 1.5	N	Maximum tap position (p.u.)
MinTap	Single	0.8	0.5 - 2	N	Minimum tap position (p.u.)
TapPosition	Single	1.0	0.3 - 2	N	Current tap position (p.u.)
IsAutomatic	Boolean	No	Yes, No	N	True if regulator has automatic tap changer
Regulator Setting	Single	1.0	0.5 - 2	N	Regulator set point - if automatic voltage regulation
Regulator Deadband	Single	0.01	0 - 0.2	N	Regulator deadband - if automatic voltage regulation
IsLineDrop Compensation	Boolean	No	Yes, No	N	True if voltage regulator has line drop voltage compensation
LineDrop CompensationR	Double	0	0 - 0.5	N	Real impedance value for line drop compensation (p.u.)
LineDrop CompensationX	Double	0	0 - 0.5	N	Reactive impedance value for line drop compensation (p.u.)

Example

```
<Regulator>
  <ID>1</ID>
  <ParentNode>1279</ParentNode>
  <PhElementValue>ABC</PhElementValue>
  <Rating>250</Rating>
  <PositiveImpR>0.001</PositiveImpR>
  <PositiveImpX>0.01</PositiveImpX>
  <ZeroImpR>0</ZeroImpR>
  <ZeroImpX>0</ZeroImpX>
  <TapStep>0.01</TapStep>
  <MaxTap>1.2</MaxTap>
  <MinTap>0.8</MinTap>
  <TapPosition>1</TapPosition>
  <IsAutomatic>True</IsAutomatic>
  <RegulatorSetting>1</RegulatorSetting>
  <RegulatorDeadband>0.01</RegulatorDeadband>
  <IsLineDropCompensation>False</IsLineDropCompensation>
  <LineDropCompensationR>0</LineDropCompensationR>
  <LineDropCompensationX>0</LineDropCompensationX>
</Regulator>
```

Protection Element

This element describes a fuse or relay with time-current related information.

Elements Referenced:	Node
Referenced by Elements:	-

SubElements

Name	Type	Default	Range	Req	Description
ID	Integer*	0	Positive	N	Unique line ID. *In DESS this is an integer. For import purposes this may be any value.
ParentNode	Integer*	-	Positive	Y	Node containing this protection item. Should be the same as ID element of Node element.
PhElementValue	Enumeration	ABC	A,B,C,AB,BC,AC,ABC	Y	Phasing of switch
ProtectionRef	Integer*	-	Positive	Y	Reference to type of protection item.

Example

```
<Protection>
  <ID>1</ID>
  <ParentNode>1278</ParentNode>
  <PhElementValue>ABC</PhElementValue>
  <ProtectionRef>23</ProtectionRef>
</Capacitor>
```



```

        <Week>1</Week>
        <PV>1</PV>
        <QV>1</QV>
        <PowerFactor>0.9</PowerFactor>
        <MotorFactor>0</MotorFactor>
        <ReenergizationFactor>1</ReenergizationFactor>
        <DayFactor>0</DayFactor>
        <NightFactor>0</NightFactor>
    </CharacteristicsInfoSet>
  </CharacteristicsInfoSetCollection>
</Characteristics>
</LoadCategory>
<Node>
  <ID>2</ID>
  <Name>Load</Name>
  <Description />
  <LayerRef>1</LayerRef>
  <MapPoint>
    <MapPoint>
      <coordinate>232.179226069246,49.89816700611</coordinate>
      <Rotation>0</Rotation>
    </MapPoint>
  </MapPoint>
</Node>
<Node>
  <ID>1</ID>
  <Name>Source</Name>
  <Description />
  <LayerRef>1</LayerRef>
  <MapPoint>
    <MapPoint>
      <coordinate>-344.195519348269,63.1364562118126</coordinate>
      <Rotation>0</Rotation>
    </MapPoint>
  </MapPoint>
</Node>
<Line>
  <ID>1</ID>
  <Node1>1</Node1>
  <Node2>2</Node2>
  <PhLineValue>ABC</PhLineValue>
  <Length>0.1</Length>
  <ConductorRef>1</ConductorRef>
  <MapLine>
    <MapLine>
      <coordinates>-344.1955149,63.13645626 232.1792262,49.898161</coordinates>
    </MapLine>
  </MapLine>
</Line>
<Source>
  <ID>1</ID>
  <ParentNode>1</ParentNode>
  <Voltage>22000</Voltage>
  <Angle>0</Angle>
  <MaxZeroImpR>0</MaxZeroImpR>
  <MaxZeroImpX>0</MaxZeroImpX>
  <MaxPositiveImpR>0</MaxPositiveImpR>
  <MaxPositiveImpX>0</MaxPositiveImpX>
  <MaxNegativeImpR>0</MaxNegativeImpR>
  <MaxNegativeImpX>0</MaxNegativeImpX>
  <MinZeroImpR>0</MinZeroImpR>
  <MinZeroImpX>0</MinZeroImpX>
  <MinPositiveImpR>0</MinPositiveImpR>
  <MinPositiveImpX>0</MinPositiveImpX>
  <MinNegativeImpR>0</MinNegativeImpR>
  <MinNegativeImpX>0</MinNegativeImpX>
</Source>
<Load>
  <ID>1</ID>
  <ParentNode>2</ParentNode>
  <PhElementValue>B</PhElementValue>
  <Loads>
    <LoadSetCollection>
      <LoadSet>
        <LoadingA>0</LoadingA>
        <LoadingB>100</LoadingB>
      </LoadSet>
    </LoadSetCollection>
  </Loads>
</Load>

```

```
        <LoadingC>0</LoadingC>
        <Season>1</Season>
        <LoadUnit>kW</LoadUnit>
        <Scaling>1</Scaling>
    </LoadSet>
</LoadSetCollection>
</Loads>
<Category>1</Category>
<IsPhaseToPhase>True</IsPhaseToPhase>
</Load>
<SystemData>
    <BackgroundMaps>
        <BackgroundLayerCollection />
    </BackgroundMaps>
    <ZoomWidth>0</ZoomWidth>
    <CenterX>0</CenterX>
    <CenterY>0</CenterY>
    <ActiveLayer>1</ActiveLayer>
    <PhaseA>a</PhaseA>
    <PhaseB>b</PhaseB>
    <PhaseC>c</PhaseC>
    <CoordinateUnit>Meters</CoordinateUnit>
    <NodeStyleRules>
        <NodeStyleRuleCollection />
    </NodeStyleRules>
    <LineStyleRules>
        <LineStyleRuleCollection />
    </LineStyleRules>
</SystemData>
</System>
```

Sample Import File

The following example is the same minimal DESS system described above. This is typical for an import file. No definitions exist for load types or conductors. By comparing to the previous example you can also see that many of the detailed data elements with default (or unknown) data have been omitted.

```
<?xml version="1.0"?>
<System>
  <Layer>
    <ID>1</ID>
    <Voltage>22000</Voltage>
    <Type>FourWire</Type>
  </Layer>
  <Node>
    <ID>B726</ID>
    <Name>Load</Name>
    <LayerRef>1</LayerRef>
    <MapPoint>
      <MapPoint>
        <coordinate>232.179226069246,49.89816700611</coordinate>
      </MapPoint>
    </MapPoint>
  </Node>
  <Node>
    <ID>C451</ID>
    <Name>Source</Name>
    <LayerRef>1</LayerRef>
    <MapPoint>
      <MapPoint>
        <coordinate>-344.195519348269,63.1364562118126</coordinate>
      </MapPoint>
    </MapPoint>
  </Node>
  <Line>
    <ID>1</ID>
    <Node1>B726</Node1>
    <Node2>C451</Node2>
    <PhLineValue>ABC</PhLineValue>
    <Length>0.1</Length>
    <ConductorRef>1/0 Cu XLPE 3-Phase 14.4kV</ConductorRef>
    <MapLine>
      <MapLine>
        <coordinates>-344.195519348269,63.1364562118126
232.179226069246,49.89816700611</coordinates>
      </MapLine>
    </MapLine>
  </Line>
  <Source>
    <ID>DS Station</ID>
    <ParentNode>C451</ParentNode>
    <Voltage>22000</Voltage>
  </Source>
  <Load>
    <ID>Tx 90B</ID>
    <ParentNode>B726</ParentNode>
    <PhElementValue>B</PhElementValue>
    <Loads>
      <LoadSetCollection>
        <LoadSet>
          <LoadingB>100</LoadingB>
          <Season>Full Year</Season>
          <LoadUnit>kW</LoadUnit>
          <Scaling>1</Scaling>
        </LoadSet>
      </LoadSetCollection>
    </Loads>
    <Category>Residential Load</Category>
    <IsPhaseToPhase>True</IsPhaseToPhase>
  </Load>
</System>
```