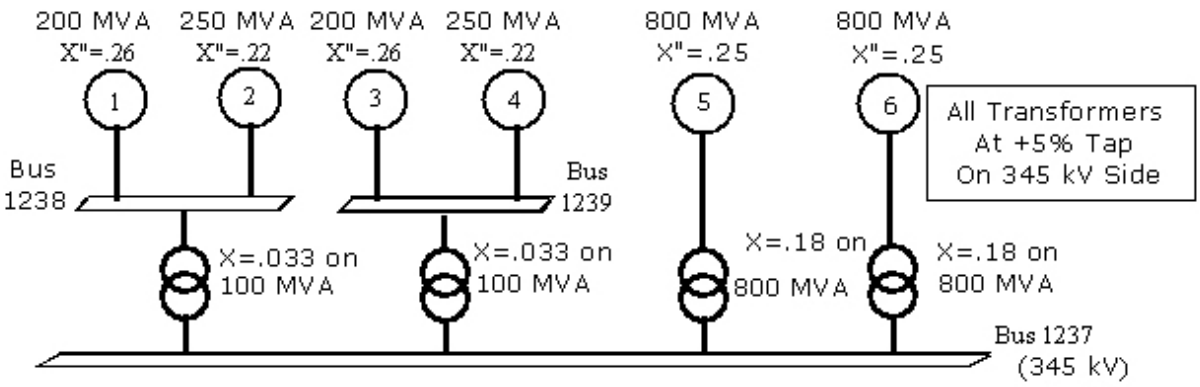

Figure 1.5. Multiple Generators at a Single Plant

```
   I,'ID',   PG,QG,   QT,  QB,   VS,IREG,NREG, MBASE,  ZR,  ZX,  T,   XT, GTAP,STAT, RMPCT, ...

1238,'1 ', 200.,  , 120., 0.0, 1.03,   0,   0, 200.0, 0.0, .26, 0.,  0.0, 1.00,    1, 50.0, ...
1238,'2 ', 250.,  , 150., 0.0, 1.03,   0,   0, 250.0, 0.0, .22, 0.,  0.0, 1.00,    1, 50.0, ...
1239,'3 ', 200.,  , 120., 0.0, 1.03,   0,   0, 200.0, 0.0, .26, 0.,  0.0, 1.00,    1, 50.0, ...
1239,'4 ', 250.,  , 150., 0.0, 1.03,   0,   0, 250.0, 0.0, .22, 0.,  0.0, 1.00,    1, 50.0, ...
1237,'5 ', 750.,  , 500., 0.0, 1.06,   0,   0, 800.0, 0.0, .25, 0., 0.18, 1.05,    1, 50.0, ...
1237,'6 ', 750.,  , 500., 0.0, 1.06,   0,   0, 800.0, 0.0, .25, 0., 0.18, 1.05,    1, 50.0, ...
```

1.11. Non-Transformer Branch Data

Each ac network branch to be represented in PSSE as a non-transformer branch is introduced by reading a non-transformer branch data record.

Branches to be modeled as transformers are not specified in this data category; rather, they are specified in Transformer Data.

When specifying a non-transformer branch between buses I and J with circuit identifier CKT, if a two-winding transformer between buses I and J with a circuit identifier of CKT is already present in the working case, it is replaced (i.e., the transformer is deleted from the working case and the newly specified branch is then added to the working case).

In PSSE, the basic transmission line model is an Equivalent Pi connected between network buses. Figure 1-8 shows the required parameter data where the equivalent Pi is comprised of:

- A series impedance (R + jX).
- Two admittance branches (jB/2) representing the line's total capacitive admittance (line charging).
- Two admittance branches (GI+jBI and GJ+jBJ) for shunt equipment units (e.g., reactors) that are connected to and switched with the line.

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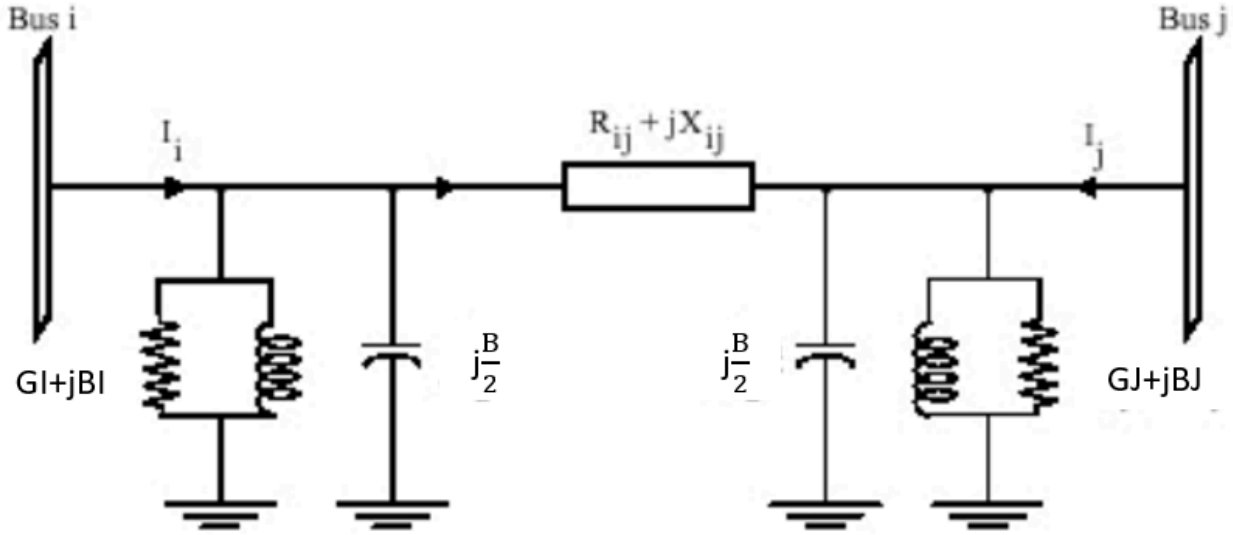
To represent shunts connected to buses, that shunt data should be entered in fixed shunt and/or switched shunt data records.



Transmission Line Equivalent Pi Model

```
I,J,CKT,R,X,B,'NAME',RATE1...RATE12,GI,BI,GJ,BJ,ST,MET,LEN,O1,F1,...,O4,F4
```

RAWX Data Table Format

```
"acline":{
    "fields":["ibus", "jbus", "ckt", "rpu", "xpu", "bpu", "name",
              "rate1", "rate2", "rate3", "rate4", "rate5", "rate6",
              "rate7", "rate8", "rate9", "rate10", "rate11", "rate12",
              "gi", "bi", "gj", "bj", "stat", "met", "len",
              "o1", "f1", "o2", "f2", "o3", "f3", "o4", "f4"],
    "data":[
        [151, 152, "1", 0.0026, 0.046, 3.5, "", 1200.0, 1100.0, 1000.0,
         1200.4, 1100.5, 1000.6, 1200.70, 1100.80, 1000.90, 1200.10,
         1100.11, 1000.12, 0.01, -0.25, 0.011, -0.15, 1, 2, 150.0, 1,
         0.2, 2, 0.3, 3, 0.4, 4, 0.1],
        ...

        [3008, 3009, "1", 0.003, 0.025, 0.06, "", 25.0, 22.0, 18.0, 0.0,
         0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1,
         2, 60.00, 1, 0.1797, 2, 0.2695, 3, 0.3594, 4, 0.1914]
    ]
}
```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Field	RAWX Key	Description
I	ibus	Branch from bus number, or extended bus name enclosed in single quotes (refer to Extended Bus Names). No default allowed
J	jbus	Branch to bus number, or extended bus name enclosed in single quotes.
CKT	ckt	One- or two-character uppercase non-blank alphanumeric branch circuit identifier; the first character of CKT *must* not be an ampersand ( ); refer to Multi-Section Line Grouping Data. CKT = '1' by default
R	rpu	Branch resistance; entered in pu. A value of R must be entered for each branch.
X	xpu	Branch reactance; entered in pu. A non-zero value of X must be entered for each branch. Refer to Zero Impedance Lines for details on the treatment of branches as zero impedance lines.
B	bpu	Total branch charging susceptance; entered in pu. B = 0.0 by default
NAME	name	Alphanumeric identifier assigned to the branch. NAME may be up to forty characters and may contain any combination of blanks, uppercase letters, numbers and special characters. NAME must be enclosed in single or double quotes if it contains any blanks or special characters. NAME *must* be unique within all non-transformer and transformer branches. NAME is blank by default
RATEn	rate1, rate2, rate3, rate4, rate5, rate6, rate7, rate8, rate9, rate10, rate11, rate12	nth rating; entered in either MVA or current expressed as MVA, according to the value specified for NXFRAT specified on the first data record (refer to Case Identification). Each RATEn = 0.0 (bypass check for this branch; this branch will not be included in any examination of circuit loading) by default. Refer to activity RATE. When specified in units of current expressed as MVA, ratings are entered as: $MVA_{rated} = \sqrt{3} \times E_{base} \times I_{rated} \times 10^{-6}$ where: E_{base} is the base line-to-line voltage in volts of the buses to which the terminal of the branch is connected I_{rated} is the branch rated phase current in amperes.
GI, BI	gi, bi	Complex admittance of the line shunt at the bus I end of the branch; entered in pu. BI is negative for a line connected reactor and positive for line connected capacitor. GI + jBI = 0.0 by default

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Field	RAWX Key	Description
GJ, BJ	gj, bj	Complex admittance of the line shunt at the bus J end of the branch; entered in pu. BJ is negative for a line connected reactor nd positive for line connected capacitor. GJ + jBJ = 0.0 by default
ST	stat	Branch status of one for in-service and zero for out-of-service; ST = 1 by default
MET	met	Metered end flag; • <= 1 to designate bus I as the metered end • >= 2 to designate bus J as the metered end MET = 1 by default PSSE assigns losses to non-metered end of the branch.
LEN	len	Line length; entered in user-selected units. LEN = 0.0 by default
Oi	o1, o2, o3, o4	Owner number (1 through 9999). Each branch may have up to four owners. By default, O1 is the owner to which bus I is assigned (refer to Bus Data) and O2, O3, and O4 are zero.
Fi	f1, f2, f3, f4	Fraction of total ownership assigned to owner Oi; each Fi must be positive. The Fi values are normalized such that they sum to 1.0 before they are placed in the working case. Each Fi is 1.0 by default

Non-transformer branch data input is terminated with a record specifying a from bus number of zero.

The branch is treated as series compensated line when its R=0 and X is < 0.

1.11.1. Zero Impedance Lines

PSSE provides for the treatment of bus ties, jumpers, breakers, switches, and other low impedance branches as zero impedance lines. For a branch to be treated as a zero impedance line, it must have the following characteristics:

- Its resistance must be zero.
- Its magnitude of reactance must be less than or equal to the zero impedance line threshold tolerance, THRSHZ.
- It must be a non-transformer branch.

During network solutions, buses connected by such lines are treated as the same bus, thus having identical bus voltages. At the completion of each solution, the loadings on zero impedance lines are determined.

When obtaining power flow solutions, zero impedance line flows, as calculated at the end of the solution, are preserved with the working case and are available to the power flow solution reporting activities. Similarly,

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