

**LOAD FLOW SOLUTIONS OF TEST
POWER SYSTEMS UNDER CONTINGENCY:
FORMATTED DATA FILES**

J.W. Bandler, M.A. El-Kady and G. Centkowski

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LOAD FLOW SOLUTIONS OF TEST POWER SYSTEMS
UNDER CONTINGENCY: FORMATTED DATA FILES

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Abstract

Formatted data files containing the load flow solutions of the 26-bus and the IEEE 118-bus test power systems under a contingency, i.e., when a single transmission line is removed from the original system, are presented in this report. These files have a standard form as is required by the CNTL package. All the load flow solutions available on these files have been calculated using the CTTM1 package. Data files have been prepared for use on the CDC 170/730 system with the NOS 1.4 level 552 operating system. Auxiliary software comprising subroutines for reading data from these files and for creating data are also discussed.

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The authors are with the Simulation Optimization Systems Research Laboratory and the Department of Electrical and Computer Engineering, McMaster University, Hamilton, Canada L8S 4L7.

M.A. El-Kady is also with Ontario Hydro, Toronto, Canada.

G. Centkowski is on leave from the Institute of Electronics Fundamentals, Technical University of Warsaw, Warsaw, Poland.

I. INTRODUCTION

The main purpose of this report is to present formatted data files containing the load flow solutions of a 26-bus and the IEEE 118-bus test power systems [1-4] under a contingency, i.e., when a single transmission line is removed from the original system. All the load flow solutions available on these files have been calculated using the CTTM1 package [5]. The demanded accuracy of each solution of the load flow equations of the power system under a contingency was 10^{-4} .

To separate an input and/or an output operation from the user's program, two data handling Fortran routines have been prepared, namely, CORDAT which reads data from these files, and COFDAT which creates the same kind of files. Both subroutines are included in the CNTL package [6].

II. AVAILABLE DATA FILES

There are two different files containing results of the test power systems simulation under emergency conditions, namely CL026 and CL118.

It is assumed that a data file name consists of five alphanumeric characters. The first two characters are CL followed by a 3-digit number to identify the number of buses of the power system. The files mentioned above consist of a number of subfiles, which contain the load flow solutions of the test power systems with a different single line removed. Each subfile has header records with a corresponding subfile identifier. The first five characters of the identifier are identical with the data file name. The next three characters correspond to an index of the line removed from the original test power system.

The list of available files and subfiles is provided in Table I.

TABLE I
AVAILABLE FORMATTED DATA FILES AND SUBFILES

File Name	Content of File			
CL026	CL026001, CL026007, CL026011, CL026015, CL026019, CL026023, CL026027	CL026003, CL026008, CL026012, CL026016, CL026020, CL026024,	CL026004, CL026009, CL026013, CL026017, CL026021, CL026025,	CL026006 CL026010 CL026014 CL026018, CL026022 CL026026,
CL118	CL118024,	CL118098,	CL118102,	CL118150

III. DATA HANDLING ROUTINES

Two subroutines have been prepared to simplify data reading, and creating new data subfiles, namely, CORDAT and COFDAT. The subroutine CORDAT selects an appropriate subfile containing the load flow solution of the power system with a specified line removed from a supplied data file and reads this solution. The subroutine COFDAT creates an appropriate data subfile from the load flow solution supplied. The full description of the data handling subroutines is presented in [6].

IV. ACCESSING DATA FILES AND DATA HANDLING SUBROUTINES

The data files listed in Table I are available as permanent group indirect files under the charge RJWBAND. The GET control statement enables us to retrieve a copy of the data file for use as a local file. The NOS command to use the data is as follows:

for the 26-bus power system

/GET, lfn = CL026/GR.

for the IEEE 118-bus power system

/GET, lfn = CL118/GR.

where lfn is a local file name given the file while in use.

The data handling routines are available in the package CNTL. This package is available in the form of a library of binary relocatable subroutines which are linked with the user's program by appropriate call to subroutines in the package. The name of library is LIBCNTL. The library is available as a group indirect file under the charge RJWBAND. The general sequence of NOS commands to use the package can be as follows.

/GET, LIBCNTL/GR. - fetch the library,

/LIBRARY, LIBCNTL. - indicate the library to the loader.

V. DATA FILE STRUCTURE

As mentioned in Section II, the data files are composed of the set of the data subfiles. The format of the data subfile is strictly fixed, as is required by subroutine CORDAT. Logically, the data subfile constitutes three sections, a data header, a bus voltage data and an end-of-subfile, that contains a header only.

The data header contains three records. Only the second record is non-empty. It contains the data identifier which represents the data subfile name. The first five characters of this record are identical with the data file name. The next three characters correspond to the index of a line removed from the original power system. The section of bus voltage data contains a bus voltage header followed by the sequence of NB records containing bus voltages.

The bus header consists of two records. The first non-empty record contains the names of all physical data appearing in the bus data. The names are as follows.

BNR - bus index, where it is assumed that the buses are numbered consecutively from 1 to NB and the slack bus has the highest index.

BVREAL - bus voltage real part,

BVIMAG - bus voltage imaginary part,

BVMOD - bus voltage modulus,

BVARG - bus voltage argument (in radians).

The structure of a record containing the bus voltage is explained in Table II.

The last section of the subfile is the end-of-subfile records that contains a header only. The first three characters are END followed by six digits, which are identical to the digits in the subfile's header.

TABLE II
FORMAT OF RECORDS

Character Position	Bus Data Record	Data Type
2 - 5	BNR	Integer
9 - 20	BVREAL	Real
22 - 31	BVIMAG	Real
33 - 34	BVMOD	Real
36 - 47	BVARG	Real

Two examples of subfiles containing the load flow solution of the 26-bus system, namely, CL026001 and CL026024 are listed on page 6.

Examples of the subfiles

CL026001

BNR	BVREAL	BVIMAG	BVMOD	BVARG
1	.10249E+01	.13902E+00	.10343E+01	.13481E+00
2	.74262E+00	.79174E+00	.10855E+01	.81740E+00
3	.10361E+01	.11729E+00	.10427E+01	.11273E+00
4	.97569E+00	.16409E+00	.98939E+00	.16662E+00
5	.95174E+00	.33245E+00	.10081E+01	.33606E+00
6	.10310E+01	.73566E-01	.10336E+01	.71231E-01
7	.10099E+01	.63737E-01	.10121E+01	.64998E-01
8	.93036E+00	.13856E+00	.94062E+00	.14785E+00
9	.87200E+00	.13576E+00	.88250E+00	.15445E+00
10	.74757E+00	.73986E+00	.10518E+01	.78022E+00
11	.88336E+00	.28683E-01	.88383E+00	.32458E-01
12	.92902E+00	.32049E-01	.92957E+00	.34484E-01
13	.76094E+00	.80698E+00	.11092E+01	.81475E+00
14	.88501E+00	.83392E-01	.88893E+00	.93949E-01
15	.91806E+00	.15403E+00	.93089E+00	.16623E+00
16	.10353E+01	-.47118E-01	.10363E+01	-.45482E-01
17	.92722E+00	.12130E+00	.93512E+00	.13008E+00
18	.60744E+00	.83086E+00	.10700E+01	.96708E+00
19	.10437E+01	.11526E+00	.10500E+01	.11000E+00
20	.95094E+00	.30936E+00	.10000E+01	.31452E+00
21	.97373E+00	.30373E+00	.10200E+01	.30236E+00
22	.88986E+00	.15931E-01	.89000E+00	.17900E-01
23	.99965E+00	-.26551E-01	.10000E+01	-.26554E-01
24	.99440E+00	.10571E+00	.10000E+01	.10591E+00
25	.90672E+00	.42173E+00	.10000E+01	.43535E+00
26	.10100E+01	0.	.10100E+01	0.

END026001

CL026024

BNR	BVREAL	BVIMAG	BVMOD	BVARG
1	.61167E+00	-.35961E+00	.70955E+00	-.53149E+00
2	.10603E+01	.11210E+00	.10664E+01	.10532E+00
3	.65473E+00	-.42372E+00	.77987E+00	-.57438E+00
4	.57503E+00	.13093E+00	.58975E+00	.22387E+00
5	.58227E+00	.82299E+00	.10081E+01	.95505E+00
6	.99405E+00	-.11157E+00	.10003E+01	-.11177E+00
7	.66872E+00	-.33616E+00	.74846E+00	-.46580E+00
8	.72548E+00	.53162E+00	.89941E+00	.63239E+00
9	.96151E+00	-.92701E-02	.96155E+00	-.96409E-02
10	.10324E+01	.89532E-01	.10362E+01	.86509E-01
11	.81803E+00	.29210E+00	.86530E+00	.33208E+00
12	.96824E+00	-.30492E-01	.96872E+00	-.31481E-01
13	.10454E+01	.18555E-01	.10456E+01	.17747E-01
14	.90085E+00	.12912E+00	.91006E+00	.14236E+00
15	.55764E+00	.86403E+00	.10284E+01	.99767E+00
16	.10353E+01	-.47118E-01	.10363E+01	-.45482E-01
17	.74649E+00	.52914E+00	.91500E+00	.61663E+00
18	.10353E+01	.27043E+00	.10700E+01	.25551E+00
19	.10464E+01	-.86916E-01	.10500E+01	-.82872E-01
20	.53812E+00	.84287E+00	.10000E+01	.10026E+01
21	.61684E+00	.81235E+00	.10200E+01	.92135E+00
22	.81508E+00	.35741E+00	.89000E+00	.41325E+00
23	.99965E+00	-.26551E-01	.10000E+01	-.26554E-01
24	.83453E+00	-.55093E+00	.10000E+01	-.58348E+00
25	.49380E+00	.86957E+00	.10000E+01	.10543E+01
26	.10100E+01	0.	.10100E+01	0.

END026024

VI. REFERENCES

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