Automated T-Line Fault Profile PowerScript Requirements

Script Number 1.

Objective: Develop a script for ASPEN OneLiner that will automate the process for computing intermediate faults on multiple transmission lines.

User Interface Requirements:

1. Present the user with a dialog box which includes the following items:
    a. Input Filename, the user browses and selects the input file (ASCII text, likely csv format) containing the list of lines to be processed.
    b. Output File location: the user browses and selects the folder where the Fault Solution Reports for each line will be stored.
    c. Button labeled “Process”. The user clicks this button after specifying the input filename and location for the output files to begin processing the input file.
    d. Button labeled “Cancel”. The user clicks this button to exit the script without processing the input file.
    e. Status Line: The script will write a message “Processing: “followed by the output filename read from the input file record. This provides the user visual feedback that the script is progressing through the input file.

Input file structure:

1. The transmission lines to be processed will be specified by listing “From” and “To” terminal bus names, voltages and Ckt IDs. The fault profile will always begin at the “From” terminal. The “To” terminal will be the first bus encountered along the line segment, even if it is a Tap Bus. The intermediate fault calculations will ignore Tap Buses in the same manner as the interactive specification does. The last field on the record will be the filename which will be used to store the fault profiles The t-line specification includes the following items separated by commas:
    a. From Terminal Bus Number
    b. From Terminal Bus Name (1-12 Alphanumeric Characters)
    c. From Terminal Bus Nominal kV
    d. To Terminal Bus Number
    e. To Terminal Bus Name (1-12 Alphanumeric Characters)
    f. To Terminal Bus Nominal kV
    g. Ckt ID (2-characters)
    h. Output filename (including the extension .csv)
2. The last record in the t-line specification file will be an end-of-file indicator. The end-of-file indicator will be a single dollar sign ($) in the first column.

Basic Script Functions:

1. After the user specifies the input file and the location for the output files, the script performs the following functions
    a. Read the first t-line specification and output filename from record 2.
    b. Open the output file.
    c. Perform the intermediate fault calculations for each transmission line listed in the input file for the following fault specification:
        i. Intermediate Fault, No Outage
        ii. Fault Type(s): 3LG, 2LG, 1LG, and LL
        iii. Pct = 0.2%
            1. This percentage is chosen to insure that compete profiles are computed for all four faults given the limitation of a maximum of 2048 solutions.
        iv. From 0% to 100%
        v. Fault Impedance = 0.0 +j 0.0
    d. Store the results of each calculation in the output file.
    e. Close the output file.
    f. Repeat steps a-e until the end-of-file indicator is encountered.

Output File Format (separate file generated for each t-line listed in input file):

1. The data contained in the output file will be provided in csv format with a single record of data for each fault location. Each record will contain the results of up to four fault calculations at one fault location. Each record in the output file will contain the following items in this order, separated by commas:
    a. Fault location (percent)
    b. Character string 3LG
    c. Maximum Total Fault Current Magnitude for 3LG fault
    d. Complex X/R ratio for 3LG fault
    e. Maximum Contribution Current Magnitude for 3LG fault
    f. Character String 2LG
    g. Maximum Total Fault Current Magnitude for 2LG fault
    h. Complex X/R ratio for 2LG fault
    i. Maximum Contribution Current Magnitude for 2LG fault
    j. Character String 1LG
    k. Maximum Total Fault Current Magnitude for 1LG fault
    l. Complex X/R ratio for 1LG fault
    m. Maximum Contribution Current Magnitude for 1LG fault
    n. Character String LL
    o. Maximum Total Fault Current Magnitude for LL fault
    p. Complex X/R ratio for LL fault
    q. Maximum Contribution Current Magnitude for LL fault

2. The fault location, in percent is found on the FAULT DESCRIPTION record, of the standard csv file for sliding faults, after the fault type. This percentage is the percentage that is applied to the total line, not the percentage of the specific line section where at least one terminal is a tap bus.
3. The Maximum Total Fault Current Magnitude is taken from the FAULT CURRENT record in the standard csv file format. The standard csv file format provides both sequence and phase currents in rectangular format. This item corresponds to converting the phase currents from rectangular to polar format, and selecting the maximum value of the three phase current magnitudes.
4. The X/R ratio is taken from the COMPLEX X/R RATIO record on the standard csv file format.
5. The Maximum Contribution Current Magnitude is taken from the two CUR. TO LINE records of the first BUS record after the X0/X1 record in the standard csv file format. It corresponds to the temporary bus used for the sliding fault location. These two records correspond to the fault current flowing to the fault from the line terminals on each side of the fault. As with the total fault current, the standard csv file format includes both sequence and phase currents in rectangular format. This item corresponds to converting the phase currents, for each contribution from rectangular to polar format, and selecting the maximum value of the six phase current magnitudes.

Script Number 2.

Objective: Develop a script for ASPEN OneLiner that will allow the user to interactively select transmission lines from the OneLiner graphical display and store the line specification in a transmission line specification file to be used with Script Number 1 above.

User Interface Requirements:

1. Present the user with a File Specification dialog box which includes the following items:
    a. Output Filename, the user browses and selects the disk location and enters the filename which will contain the transmission line specifications which were selected interactively.
    b. Button labeled “Continue”. The user clicks on this button indicating that the transmission line specification file name and location have been selected. Clicking this button will cause the File Specification Dialog Box to close and the Transmission Line Selection Dialog Box to be displayed.
    c. Button labeled “Cancel”. The user clicks this button to exit the script without creating the transmission line specification file.
2. Present the user with a Transmission Line Selection dialog box which includes the following items:
    a. Data box labeled “Number of Lines Selected”. A running tally of the total lines selected is displayed in the box.
    b. Selected Line Data boxes (FROM (Bus name and kV), TO (Bus Name and kV), and Ckt ID). The user will click the mouse on a line section that needs to be added to the file. The FROM (Bus Name and kV) corresponds to the line terminal closest to the point where the mouse pointer was clicked. The TO (Bus Name and kV) corresponds to the other terminal of that line section. The Ckt ID corresponds to the Ckt ID for the line section where the mouse pointer was clicked
    c. Data Box for the Fault Profile Output filename. The user will enter the desired output filename which will contain the fault profile results for the selected line.
    d. Button labeled “Select”. The user clicks this button to add the transmission line identified and the output filename in the Data Boxes in step b to the transmission line specification file. After the line has been added to the file, the data boxes in steps b and c are cleared.
    e. Button labeled “Clear Selection”. The user clicks this button to clear the transmission line identified in the Data Boxes in step b. The data boxes in step b are cleared without adding the line to the transmission line specification file.
    f. A scrolling area where the FROM (Bus Name and kV), TO (Bus Name and kV), and Ckt ID where a scrolling list of each line selected is displayed.
    g. Button labeled “Finished”. The user clicks this button after the all transmission lines have been selected.
    h. Button labeled “Cancel”. The user clicks this button to exit the script without creating the transmission line specification file.

Output File Structure

1. The transmission lines to be processed will be specified by listing “From” and “To” terminal bus names, voltages and Ckt IDs. The fault profile will always begin at the “From” terminal. The “To” terminal will be the first bus encountered along the line segment, even if it is a Tap Bus. The intermediate fault calculations will ignore Tap Buses in the same manner as the interactive specification does. The last field on the record will be the filename which will be used to store the fault profiles The t-line specification includes the following items separated by commas:
    a. From Terminal Bus Number
    b. From Terminal Bus Name (1-12 Alphanumeric Characters)
    c. From Terminal Bus Nominal kV
    d. To Terminal Bus Number
    e. To Terminal Bus Name (1-12 Alphanumeric Characters)
    f. To Terminal Bus Nominal kV
    g. Ckt ID (2-characters)
    h. Output filename (including the extension .csv)
2. The last record in the t-line specification file will be an end-of-file indicator. The end-of-file indicator will be a single dollar sign ($) in the first column.

Basic Script Functions:

1. Script displays the Filename Specification dialog box.
    a. If the “Cancel” button is clicked, exit script.
    b. If the “Continue” button is clicked, retrieve filename and location from dialog box fields
2. Display the Transmission Line Selection dialog box.
    a. Change focus to the OneLiner window displaying the short circuit model
    b. If the “Cancel” button is clicked, exit the script
    c. If mouse is clicked on a line section in the OneLiner window, the line will be displayed as a dashed red line in the OneLiner Window , place the FROM, TO, and Ckt ID information in the Selected Line data boxes. The FROM bus is the bus closest to where the mouse pointer was clicked. Change focus to the Fault Profile Output filename data box.
    d. If the “Select” button is clicked, transfer the FROM, TO, and Ckt id and Output filename to the transmission line specification file. After the record has been added, clear the Selected Line and Fault Profile Output filename data boxes. Change focus to the OneLiner window displaying the short circuit model. Unselect the last line section.
    e. If the “Select” button is clicked with no line section in the OneLiner model selected, change focus back to the main OneLiner window displaying the short circuit model.
    f. If the “Clear Selection” button is clicked, clear the data in the Selected Line Data boxes and the Fault Profile Output filename box. Change focus to the main OneLiner Window where the short circuit model is displayed.
    g. If the “Finished” button is selected, close the transmission line specification file and exit the script.