ASPEN OneLiner™
Version 14.7 Update

This maintenance release contains fixes for all known bugs to date, plus some program improvements. This is a maintenance release. (The differences between a maintenance release and a major release are explained on the last page.)

You have been given a link to download the setup program OneLinerV14.7Setup.exe. You can run this setup to update an existing installation or to create a new OneLiner v14 installation. Please write to support@aspeninc.com in English (suporte@aspeninc.com in Spanish and Portuguese) or call us (650-347-3997) if you have questions.

Program Improvements between Versions 14.6 and 14.7

- **The Check | Relay Coordination Using Stepped Events command now works on 3-terminal lines.** The dialog box for this feature is the same as that for 2-terminal lines. For now, the command works only for a single 3-terminal line at a time. We plan to automate it for multiple lines in a subsequent program update.

- **The Check | Relay Coordination Using Stepped Events command now takes into account lines protected by single- or dual-pilot schemes that are not modeled in OneLiner.** In essence, it assumes that the relays modeled in OneLiner are backup relays only.
  - Lines with dual pilot: You can mark a line of this type by giving a special tag to one of the relay groups at the ends of the line. (The default tag is “Sph2”.) For a line that is protected by dual pilot, the program will simulate a small number of steps just to make sure that there are no instantaneous over-reaching relays on neighboring branches that trip on faults on the study line. You can set the maximum number of steps (in the Check | Relay Checking Parameters dialog box) to 1, 2 or 3. The default is 1. No branch outages of any kind are taken for dual-pilot lines.
  - Lines with single pilot: You can mark a line of this type by giving a special tag to one of the relay groups at the ends of the line. (The default tag is “Sph1”.) No double branch outages are taken for single-pilot lines. OneLiner will take single branch outages only if you set the option “Allow single branch outages for lines with single pilot” (in the Check | Relay Checking Parameters dialog box) to ‘Y’. The default is ‘N’.

- **Other improvement in the Check | Relay Coordination Using Stepped Events command:**
  - Added the option to include 2-line-to-ground faults for the stepped-event simulations. Previously, only single-line-to-ground and 3-phase faults were allowed.
  - Added the option to specify a fault resistance for single-line-to-ground faults.
  - Added an option (in the Check | Relay Checking Parameters dialog box) to stop the stepped-event simulation when the fault current has dropped to near zero and the next event is a reclosing event. The default is “No” because it is possible for misoperations to happen during a reclose.
  - Added a dialog to show the progress when this command is running. You can stop the simulation at any time by pressing the Cancel button.
o Added an option (in the Check | Relay Checking Parameters dialog box) to omit outaging a branch if it contributes less than a certain number of amperes when 3-phase and single-line-to-ground faults are simulated at the ends of the study line. The default is 0.1A. The simulation of these bus faults are done routinely before the stepped-event simulations, in order to rank the outaged branches.

o Added an option (in the Check | Relay Checking Parameters dialog box) to treat switches at the ends of the study line as circuit breakers. This option is designed for cases in which the user has built detailed breaker schemes using switches. (Before this option was available, the opening of those switches were reported as “Other branch tripped before the study line is cleared.”)

o The program now gets the total clearing time by looking for the time stamp of the first event in which the fault current goes below 1A and the next event is not a tripping event. This change avoids the inclusion of reclosing events in the total clearing time.

o Used abbreviated relay-type names to make the checking report easier to parse, e.g. OCP for overcurrent phase. Also information in the column "CTI INFO" in the checking report is now under three separate columns "CTI(s)", "CTI RELAY" and "CTI BRANCH".

o In the summary report, the number of “other errors” for each line is now broken down into three separate counts:
  - The “number of branch-open errors” for the number of branches that were tripped before the study line is cleared,
  - The “faults-not-cleared errors” for faults that were not cleared at the end of the stepped-event simulation, and
  - The “Too-long-to-clear errors” for faults that took too long to clear. There is no change to the count of “CTI warnings”.

o The speed of the coordination-checking command has been greatly improved. In many cases, it works 3 to 4 times faster than before.

• **Improvement in the Check | Relay Parameters command:**
  o Added a new column for distance relay zone-2 checking: Z2/ZBusR - The zone-2 reach divided by the magnitude of the apparent impedance for a fault at the remote bus, as seen by the local relay.
  o Added a dialog to show the progress when this command is running. You can stop the simulation at any time by pressing the Cancel button.
  o Added a table of SIRs at the end of the report for each end of the study line. SIR for single outage of lines and transformers are included.
  o Added an option (in the Check | Relay Checking Parameters dialog box) to omit double branch outages when checking the OC-relay-current-to-pickup-current ratio when faulting the remote bus.
  o Allow separate minimum OC-relay-current-to-pickup-current ratio for cases with no branch outage and for cases with branch outages.

• **The following commands have been streamlined to take you directly to the appropriate page of the File | Preferences command without the annoying dialog box that appeared in previous version of the program:** Network | Options, Diagram | Options, Relay | Options, Fault | Options, and Faults | X/R Ratio Parameters.
- New setting import scripts for SEL and GE line protection relays with enhanced user interface and additional logic for importing directional-element settings, common time delay and relay-trip-logic equation.

- The new Relay | Relay Database | Data link dashboard command replaced the old commands Relay | Relay database | Retrieve. The dashboard will help you ensure that all relays in the OLR file have up-to-date settings. The Dashboard is designed to work with OneLiner relays that had been linked to the ASPEN Relay Database or to the RDB and URS setting files in OneLiner’s setting file folder.

- The newly enhanced Relay | Import command now also reads relay settings from the ASPEN Relay Database and from RDB and URS setting files in the program setting file folder.

- Added Tags filter in the Fault Clearing Summary command dialog box to let you run the command on lines with selected tag string.

- Enhancements in OC Curves Window’s damage-curve logic: 1) The program now applies correct automatic horizontal shift factor to damage curve of delta-zigzag transformer in faults with all connection types: 1LG, 2LG, LL and 3LG; 2) The dialog box for copying transformer impedance from the network now includes all 3-winding transformer impedances: PS, ST, PT.
- **New SIR Calculator command:** This command calculates source impedance (SIR) ratio for a line, using a method from the paper by Thompson and Somani. You have the option to include in the report the SIR computed with line and transformer outages.

- **Made possible** the inclusion of voltage-controlled current sources in a flat-start short circuit simulation and in breaker-rating studies.

- **Updated the depiction of the PRC-026-I region for overcurrent phase relays:** The new drawing is much easier to understand. All you have to do is to keep the curve outside of the rectangular region.

- **New Line Impedance report in the distance relay dialog box:** The program now shows the line-impedance information on the TTY Window, instead of a dialog box. The output for the remote lines is more extensive. For each remote line, the impedance and the K factor from the relay location to the intermediate points are shown. Also in the report are the impedances of lines that are behind the relay. The updated Relay | Options dialog box allows you to input 3 different percentages for the primary line, plus 3 different percentages for the remote lines, for the purpose of generating the report.
- The Network Export function for PTI PSS/E format has been expanded to include version 34.
- **Added logic** to let you retry connecting to a network key before the program is disabled.
- **Added a new option in the Check Primary / Backup Coordination command** to let you run the check on all coordination pairs that involve the selected group. In previous program versions, you can select to check selected relay group against its backups or against the groups that it backs up, but not both in a single run.
- **Added logic in the Check Primary / Backup Coordination command** to include in outage list all lines found on the other side(s) of the transformer at the relay bus.
- **Updated the Fault locator command** to consider a wider range of fault resistance (up to 100 ohm)
- **New user-defined parameters in Unstable Power Swing Region command**: system separation angle, sending-to-receiving end voltage ratio. Previous OneLiner versions used a fixed default values for these inputs.
- **Enhancements of the kV Color code dialog**: Enlarged dimensions and made the border sizable to enhance the dialog appearance on high resolution screens.
- **Improve the Help file display logic** to avoid problem in showing content of CHM help from files located on network drive.
- **Changed the permissible lower limit** of SEL V2-polarized directional setting I2/I0 to 0. A value of 0 will disable this threshold in directional calculation for SEL relay models that do not have this setting parameter.
- **Changed the permissible upper limit** of SEL V2-polarized and V0-polarized directional settings PTR to match SEL hardware capabilities.
- **Added shortcut keys**:
  - Ctrl+Alt+T for Network | Tag Browser command.
  - Ctrl+A for Fault | Arc Flash Calculator command
- **Added support in the Arc flash calculator for the latest IEEE 1584-2018 standard.** The command for the older standard is still available.
- **New graphical logic scheme operation window.** The graphic display of logic signal is more descriptive and easier to follow than the text report that was displayed in previous program versions.
- **New and updated PowerScript functions**:
  - Updated ReadChangeFile() to support the input nFlag=2: Silent mode with TTY log file
  - New functions GetWindowsEnvironmentVariable(), GetObjJournalRecord()
• **New commands** in the Power Script Run1LPFCommand() functions:
  - EXPORTNETWORK: runs the File | Export Network command
  - EXPORTRELAY: runs the Relay | Export command
  - CHECKRELAYOPERATIONPRC023: runs the Check | Relay Loadability command
  - CHECKRELAYOPERATIONPRC026: runs the command for checking phase relays in the OLR network against PRC-026-1 stable power swing criteria and generates a pass/fail report.
  - CHECKRELAYOPERATIONSEA: runs the command Check | Relay operations using stepped events.
  - CHECKRELAYSETTINGS: runs the command Check | Relay settings.
  - CHECKPRIBACKCOORD: runs the command Check | Primary/backup coordination.
  - BUSFAULTSUMMARY: runs the command Fault | Bus fault summary.
  - INSERTTAPBUS: runs the Network | Bus | Insert tap bus command
  - SAVEDATAFILE: runs the File | Save and File | Save as commands
  - ARCFLASHCALCULATOR: runs the Fault | Arc flash calculator command

The Power Script Run1LPFCommand() is designed to greatly simplify the task of automatic execution of the supported OneLiner program commands. The input for the Run1LPFCommand() function is an easy-to-understand XML-formatted string that user can compose using a text editor.

• **New input parameter for system separation limit** in the dialog box for Distance relay and Overcurrent relay window command **Add | Unstable power swing and loss-of-synchronism.** In previous OneLiner versions, the program used the PRC-026-1 recommended default value of 120 degree for this limit.

• **Improved Time-Distance Diagram.** The Time-Distance (TD) Diagram Window has a number of improvements:
  - You can show up to 7 curves at each relay group.
  - When you click on a curve name, the program will redraw the corresponding curve with a dash pen. This is done to help you figure out which curve is which.
  - To edit a relay, you need simply double-click on the curve name.

**New features and bug fixes in the Case Comparison Program since version 14.6**

• **Added command-line parameter support:** You can now launch the Case Comparison Program executable differ.exe with a set of command-line parameters that include the path name of the input and output files and a program configuration file. This change effectively makes it possible for you to run the comparison in batch mode without additional interactive inputs. This feature will allow application of the Case Comparison Program in automatic network and relay model data management systems.
• Fixed error in DXT file import logic for Generators, Loads, and Shunts.
• Fixed a memory bug in logic for reading relay data from OLR file.
• Fixed a bug in the logic for checking parallel switches.
• Added logic for comparison of relay external data links.
• Fixed a bug in the breaker data comparison logic
New features and bug fixes in PTI PSS/E-to-ASPEN Data Conversion Program since version 14.5

- Fixed a bug in the logic for writing switched shunt data.
- Fixed a number of conversion issues for transformer configuration types that were introduced in version 33.
- Fixed a bug in the logic for code 133 for wye-delta-delta transformers in the sequence file.
- Added support for PSS/E V34 format.
- Fixed a bug in the logic for reading switch data from SEQ file.

Bug Fixes in OneLiner between Version 14.6 and 14.7

- Bug fix in the relay dialog export wizard: the option for RAT file output did
- Fixed bug in PowerScript SetData() logic for SC_dR and SC_dX
- Added missing column R to the data browser Series cap/reactor table.
- Fixed bug in Export relay test file command that caused program crash when the Save to single file flag is on.
- Bug fix in data browser data sort logic: It did not work when some column is selected.
- Bug fix in the Save copy for new study date command: The Case Changed flag was not being reset correctly.
- Fixed bug in the Check relay loadability command: The current multiplier for transformer was not being applied correctly.
- Bug fix in the EVE and CEV file reader: The voltage unit was hard coded as kV incorrectly.
- Bug fix in the Relay | Relay DB | Retrieve setting command: OneLiner relay last changed date data was not displayed correctly.
- Bug fix in PowerScript Compute Relay Time() script function.
- Bug fix in GCX distance relay type K factor logic: Zone 1 and 2 should both use K1
- Bug fix in the Check minimum pickup and Check instantaneous relay command: dialog box logic for checking report did not work
- Added a separate limit for the ratio of Zone-2 impedances to apparent fault impedance at the remote end of the study line. Now there are two such limits, one for phase relays and one for ground relays.
- Bug fix in logic for computing fault current on a transmission line: The program produced incorrect results in some OLR networks where series capacitors with MOV-protection are present.
- Fixed a problem when user (1) selected the "Outage 2 lines" and/or the "Outage 2 transformers" option for the Check Relay Coordination using Stepped Events command and (2) there are lines or transformers running parallel to the study line, causing the fault simulation logic to bomb.
- Improve Paste mu pair command to better match incoming data to the line pair that user highlighted on the 1-line diagram.
- Fixed a problem with VCCS in power flow solution. The voltage and current injection did not match the voltage-current-power-factor schedule exactly.
- Bug fix: Enable the Change type button in DS relay dialog box for SEL 421P__ > SEL 411P__ and SEL 421G__ > SEL 411G__.
- Bug fix in PowerScript BR_nRlyGrp3Hnd logic.
• Bug fix: Added branch letter to the bus list entries in the place bus command dialog box
• Bug fix in PowerScript GetRelay(). Function sometime did not return the first relay in the relay group.
• Bug fix in the logic for printing distance relay operation details to TTY window.
• Fixed a bug for PowerScript function ComputeRelayTime(), to fetch the value from array imported from power script, the index should start from 1 instead of 0.
• Bug fix: PowerScript PostGenParam() and PostSWParam() did not apply the Case Changed flag.
• The documentation for these two relay checking commands has been updated.
• Fixed bug in voltage-polarized directional element logic simulation of OC relay: The logic evaluation did not have correct default value of FALSE.
• Fixed a bug in Relay group Store Setting command logic that caused program crash.
• Fixed a bug in the breaker checking W3 logic for operating kV vs. Max designed kV comparison. The program display a false negative results in some cases.
• Bug fix in memoryVolts(): cross polarization voltage magnitude for phase relay is SQRT3 too low and for ground relays is SQRT3 too high.
• Bug fix: Relay | Retrieve relay setting command zone/area filter did not work.
• Bug fix: Phasor vector rotation did not refresh when reference is changed.
• Bug fix: The Check relay loadability command logic did not take into account OC relay Delta CT connection flag
• Added logic to disallow simultaneous intermediate faults on two or more lines that are within the same mutual group.
• Added logic to disallow simultaneous close-in fault on two more lines that are connected to the same bus.
• Fixed bug in displaying logic for vertical text.
• Fixed a bug in allBusesInTiersEx() that caused the Check Relay Coordination Using Stepped Events to hang in some cases when the checking extent is set to "Lines within xxx tiers"
• Fixed memory leak in one-line display logic
• Fixed bug in Phasor Probe command’s Copy to clipboard and Print to TTY. The phasor outputs were wrong when the phasor angle reference is something other than System.
• Fixed a bug in Checking Relay Coordination using Stepped Events that causes the program to hang.
• Fixed bug in distance relay simulation: cross-polarized voltage magnitude was not being scaled correctly
• Fixed bug in Export Relay dialog box logic for handling differential and voltage relays.
• Fixed bug in Tag browser logic for devices.
• Bug fix in Bus Fault Summary dialog box’s “exclude tap bus” checkbox logic.
• Fixed bug in relay loadability report output for distance relay settings
• Fixed bug in V14.6 ArcFlash dialog box OK button logic. The button click did not do anything because of this bug.
• Fixed bug in Case comparison program: RDBX connection data were not being handled correctly.
• Fixed bug in the read text data file command that caused the program to always use ‘as delimiter regardless of the delimiter parameter in DXT file header
• Fixed bug in the logic for setting gen ref angle, which caused program crash
- Fixed bug in logic for enabling/disabling Relay DB buttons in OC and DS relay dialog boxes.
- Fixed logic for setting default value of typical X/R to set: 80 for generator, 40 for transformer, and 80 for reactor.
- Fixed bug in the classical fault command that caused program crash when the selected branch does not have a relay group.
- Fixed bug in V14.6 logic for applying reference angle to quantities in relay test file
- Fixed bug in V14.6 relay group import button logic
- Fixed a bug in prefault voltage calculation logic: Increased high-voltage shutdown limit of VSC’s to 2.0.
- Fixed bug in linked setting file logic.
- Fixed bug in logic for setting default setting file folder.
- Fixed bug in relay group export button.
- Fixed bug in Data browser reset logic.
- Fixed error in PowerScript logic for the GetRelay() function.
- Fixed several bugs in the Time-Distance (TD) Window: The line-to-line fault option was not working. The caption box sometimes displayed a different fault type than what was selected in the options dialog box. The program hanged when you have more than 5 lines on the TD diagram. Also, the sliders did not remain at the same impedance coordinate after you have added or removed lines from the diagram.

Explanation of Maintenance Release and Major Release

OneLiner’s version number consists of two integers separated by a period, such as 14.7. The first integer “14” is the major release number, and the second integer “7” is the minor release number. There are relatively few differences in program features between minor releases, e.g., between version 14.6 and version 14.7. Also, no new parameters are introduce for any network or relay objects in minor releases. Most of the changes between minor releases are bug fixes. This means that the data files generated by different minor releases are 100% compatible.

Major changes in program features and network and relay models happen only between major releases.

Backward and Forward Compatibility of OLR files

Backward compatibility: OneLiner can read olr data files generated by previous versions (3.1 or later) with no loss of information. Version 3.1 was released in 1990.

Forward compatibility: OneLiner can read olr files generated by future versions. For example, OneLiner v12 can read olr files generated by v14, except new objects and new parameters not available in v12 will be omitted by the v14’s read-file logic.

Backward and Forward Compatibility of DXT files

Text data files with extension DXT were intended to be a medium of data transfer between data conversion programs and OneLiner of the same major version. Due to popular demand, OneLiner v14 can read DXT files generated by OneLiner v12. This is the only exception.