pennsylvania
DEPARTMENT OF TRANSPORTATION

ATSPM Ad-Hoc Tool Intersection Configuration Guide

November 29, 2023 – revised May 19, 2026

Introduction

The Automated Traffic Signal Performance Measures (ATSPM) Ad-Hoc Tool was developed to allow user-acquired high resolution traffic signal event log data to produce visualizations of various performance measures and convert the raw data to a spreadsheet-readable format for further analysis.

The ATSPM Ad-Hoc Tool is available on the traffic signal portal at the following URL: https://docs.penndot.pa.gov/Public/Bureaus/BOO/ATSPM/index.html

The ATSPM Ad-Hoc Tool is designed for analyzing data for one calendar day (up to 24 hours) for one intersection at a time.

Basic Intersection Configuration

After uploading high resolution data, the intersection configuration is displayed.

If the high resolution data is uploaded as a ZIP file with the Intersection ID in the filename, the tool attempts to load a previously-defined configuration based on the Intersection ID.

The Intersection Configuration screen has the following sections:

- General Intersection/Controller Information
- Sequence: Ring and Barrier Designer
- Movement Summary
- Approaches
    - Movements
    - Detectors

Several basic metrics do not require any intersection configuration, but the other metrics require configuration. The required information to produce various metrics is indicated in the following table.

Table 1: Required Configuration for Various Metrics

Configuration Item	Phase Termination	Split Monitor	Ped Delay	Purdue Coord. Diag.	Flow Profile	Purdue Split Fail	Split Trends	Turning Movement Count	Wait Time	Queue Length	Transitions	Preemption	Coord Timeline	Cycle Timeline	Watchdog
General Intersection/Controller Information															
Street Names	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]
Latitude/Longitude															
Offset Reference													X		
IP Address															
Controller Type															
Sequence															
Ring and Barrier													X	X	
Approaches															
Direction (NB, SB, etc.)		X													
Description	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]
Approach Speed				X	X					X					
Protected/Permitted Phases						X	X								
Pedestrian Phase															
Movements		X													
Approaches → Movements															
Protected/Permitted Phases and Overlaps		X		X		X			X						
Channel #															
Lane #								X							
Dist to Stop Bar				X	X									X	X
Lane Type														X	
Advance Detector				X	X									X	X
Lane-by-Lane Count Detector								X						X	
Stop Bar Presence Detector						X	X		X					X	X

[1]Used for display purposes only in chart titles

Each section of the Intersection Configuration screen is described below.

General Intersection/Controller Information

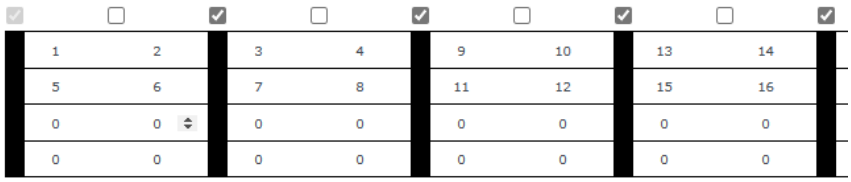
The following information is entered

Sequence

The sequence area determines the order of phases and which phases can operate together (different rings between the same barrier). The entered sequence should match the sequence and rings programmed in the controller.

The four rows represent up to four rings, and sequences in each ring proceed from left to right. Click the checkboxes at the top to insert a barrier between phases.

The “Default NEMA Sequence” button will create a new dual-ring sequence following the NEMA standard.



Note: Extra phases which are not in use are ignored by the Ad Hoc Tool. It is unnecessary to delete unused phases from the sequence.

Approaches

The ATSPM Ad Hoc Tool uses a hierarchy of approaches, movements, and detectors to develop the performance measure visualizations. An approach must be created first before movements or detectors can be added. An approach is the set of lanes at an intersection that accommodates the allowable movements (left-turn, through, and/or right-turn) from a given direction.

Information relative to the overall approach is entered in the blue bar at the beginning of each approach.

- **Direction:** Pick from dropdown menu (NB, SB, EB, WB, etc.)
- **Description:** Used for chart titles
- **Approach Speed:** Enter the speed for the approach (typically the posted speed limit). This is used to calculate the travel time between advance (upstream) detectors and the stop bar.
- **Protected Phase:**
    - If there is a protected left turn phase, enter it here (typically 1, 3, 5, or 7)
    - Otherwise, enter the thru movement phase (typically 2, 4, 6, or 8)
- **Permitted Phase:**
    - If there is a protected left turn phase, enter the phase when the left turn is permitted here (typically phase 6 when protected left-turn is phase 1, etc.)
    - Otherwise, leave blank
- **Pedestrian Phase:** Indicate the phase associated with pedestrian movements parallel to the approach direction.
- **Overlap**: There are checkboxes next to the protected phase, permitted phase, and pedestrian phase to indicate the entered number corresponds to an overlap and not a phase.

Movements

A movement is a movement taken by a vehicle at an intersection (i.e. through, left-turn, right-turn). An approach may have one or more movements.

Movements can be entered individually for each approach, or there is a shortcut button which tries to create typical movements based on the approaches and the protected and permitted phases entered for each approach.

To add movements by approach, click “Add” next to the Movements label for the approach. After entering the data, click “Save.”

Detectors

A detector refers to each detection zone which is connected to a detector input channel in the controller. Each detector is associated with a lane on an approach, and the lane may consist of one or more

movements. A lane may have multiple detectors. The following information should be entered for each detector:

- **Channel:** This refers to the detector input channel to which the detection zone is tied in the controller. For NEMA TS-1 controllers, detector channels 1-8 are typically available. For NEMA TS-2 controllers, detectors 1-16 are on BIU 9, 17-32 are on BIU 10, 33-48 are on BIU 11, and 49-64 are on BIU 12.
- **Lane #:** A unique number should be assigned to each lane on an approach. It is recommended to number lanes sequentially starting at the center and working toward the curb line.
- **Dist to Stop Bar:** The distance from the location where the detector is triggered on to the stop bar, measured in feet. This distance is used to calculate the travel time from the detector to the stop bar using the approach speed. The distance is only used for advance count detectors; for other detection types the distance can be left as zero.
- **Detection Types:** Identify the detector type as follows:
    - **Stop Bar Presence:** Detection zones located at the stop bar which operate in the presence zone and can be used to calculate occupancy. Detection zones designed for phase actuation at the stop bar are well-suited for this ATSPM detection type.
    - **Advance Count:** Detection zones located upstream from the stop bar. The detection zone should be small enough to detect individual vehicles. Ideally, there should be separate detection zones for each lane, but having one upstream zone for the entire approach will also work. Detection zones designed for volume-density operation are well-suited to also serve as advance count zones.
    - **Lane-by-Lane Count**: Detection zones located at the stop bar which are small enough to detect individual vehicles. The detection zone must be less than 20 feet in length.
- **Lane Type:** Most lanes will be classified as “Vehicle,” but other lane types can be used to classify detectors on the cycle timeline metric. For example, “Exit Lane” can be set as a lane type in combination with a lane-by-lane count detector type.

The following additional options are available in the configuration tool and the UDOT open source code, but are not currently used by the ATSPM Ad-Hoc Tool (data entered is ignored, but may be used in the future):

- Date Added
- Min. Speed Filter
- Decision Pt.
- Mvmt. Delay

To add detectors to an approach, click “Add” next to the Detectors label for the approach. After entering the data, click “Save.”

Intersection Configuration Management

The Intersection Configuration screen provides several ways to manage intersection configurations so they can be reused if data for the same intersection will be analyzed in the future.

Intersection Configuration data is stored in JSON files, which are a specially-formatted text file which are readable by web browsers. The ATSPM Ad-Hoc Tool provides a user interface to develop the configuration file. Advanced users could also edit the file manually with a text editor.

Intersection Configuration files can be managed within the ATSPM Ad Hoc Tool as follows:

- **Save Intersection Config:** Downloads the .json file to your computer (most browsers will save in the Downloads folder)

- **Import Intersection Configuration from File:** Click “Choose File” or drag a .json file from your computer into the “No file chosen” area of the screen.
- **Clear Intersection Config:** This will reset the configuration to default values, such as after uploading new high resolution data for a different intersection.
- **Load Config from Signal ID:** The tool will attempt to load the configuration from the web server based on the entered Signal ID. This will only work if the configuration was previously completed and saved to the web server.

Revision History

Date	Revision Summary
11/29/2023	Initial Version
5/19/2026	• Updated URL to ad-hoc tool