iTHEIA™ Permanent AI Traffic Data System

The iTHEIA™ Artificial Intelligence (AI) Traffic Data System uses video and machine learning to collect vehicle data for counts and classification. This non-intrusive system utilizes high performance edge AI hardware to generate accurate traffic data in several formats at the roadside.

SPECIFICATIONS

System Features

Number of Traffic Lanes	Counts and classifies up to 10 lanes of bidirectional traffic at site in real time with automatic lane boundary and flow determination
Number of Cameras	Permanent System supports up to 2 independent IP cameras to obtain clearest view and reduced occlusion for multi-lane sites Live view available in user interface
Classification Scheme	FHWA 13 Class
Accuracy	Detection > 95%, Classification > 90%
Speed Range	Vehicles traveling 1-120 mph (1-195 km/h)
Operating System	Hardened embedded Linux
Camera Lens	Varifocal lens with zoom and focus
Camera Connection	Integrated PoE+
Vehicle Image History	Vehicle thumbnail and overview images stored for 7 days
Per Vehicle Datafile Storage	Up to 60 Days for 2 cameras on 250,000 ADT sites with 8 lanes
Data Storage	Solid State Drive
Surge Protection	Ethernet surge protection
Security	Secure HTTPS web interface and file downloading
External Illumination	Focused infrared LEDs with photocell for up to 160 ft (50 meters)

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Hardware Specifications

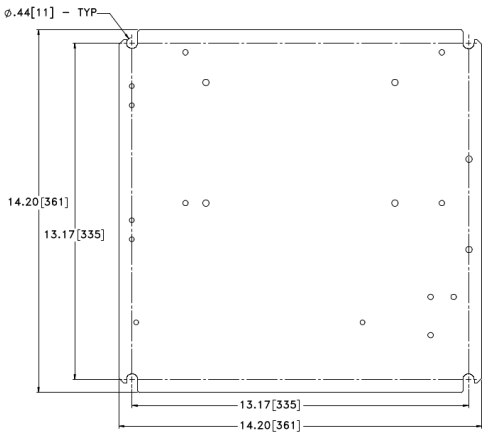
PARAMETER	MIN	MAX	UNIT
Supply Voltage Nominal	115	230	VAC
Typical Power Consumption	225 Single Camera	360 Dual Camera	W
Operating Temperature (Electronics)	-25	+60	ºC
Operating Temperature (Illuminator)	-50	+50	ºC
Outdoor CAT5e Cable Length	Up to 91 m (300 ft)		

Hardware Component Size and Weight

COMPONENT	HEIGHT	WIDTH	DEPTH	WEIGHT
Permanent System Electronics Panel	14.2 in (36 cm)	14.2 in (36 cm)	7 in (18 cm)	15 lb. (6.8 kg)
Optional Cabinet	45 in (114 cm)	25 in (64 cm)	16 in (41 cm)	135 lb. (61 kg)
Permanent System Electronics Enclosure	16 in (41 cm)	16 in (41 cm)	8 in (21 cm)	33 lb. (15 kg)
Permanent System Camera	10.3 in (26 cm)	7.1 in (18 cm)	16 in (40 cm)	13 lb. (5.9 kg)
Illuminator	9 in (23 cm)	17 in (43 cm)	6 in (15 cm)	15 lb. (6.8 kg)
Illuminator Power Supply	6.5 in (17 cm)	9.6 in (24 cm)	3.5 in (9 cm)	16 lb. (7.3 kg)

Electronics Panel





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SITE SELECTION

General Location Guidance

The camera needs a clear view of traffic on the roadway. Ideally, the view will have the whole side of vehicles, including long trucks, travelling horizontally in the camera view. Areas with obstructions such as trees, shrubs, barriers, signs, gantries, overhead lines or poles should be avoided if possible.

Selecting a pole location with street lighting beside or behind the camera is recommended as this increases performance of the system at night by augmenting the supplied illumination.

The following conditions should be avoided as performance may be reduced or impacted by these items:

- Roadways with median barriers, curves, merging lanes, or construction causing lane pattern changes.
- Camera views with bright light sources such as the sun, headlights, building lights, or parking lot lighting in the background.
- Placing iTHEIA systems directly across the road from each other on divided highways where the illuminator from one side would be visible in the camera view from the other side.
- Backgrounds with reflective surfaces such as lakes, rivers or glass/shiny buildings.
- Areas with adverse weather conditions like nearby water bodies where fog may develop frequently or hills where it may be very windy.
- Active backgrounds with moving objects not of interest – especially vehicles or equipment.
- Dusty areas like fields or construction sites.

Preferred Camera View

To optimize system performance, striving to achieve a good camera view as shown is best practice. The center of vertical viewing angle should be between 20° to 40° with respect to the roadway.



Correct View

- Vehicles are travelling perpendicular to the camera view.
- All lanes are visible.
- Lane lines are horizontal.

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Site Guidelines

The iTHEIA Permanent system comes with iTHEIA Electronics, camera including surge arrestor, and illuminator with power supply.

Ensure the supply of reliable AC power service for the system is readily accessible. Communication access also needs to be considered such as cellular service or internet access if remote access and data retrieval is desired.

For the permanent system, use an existing pole or install a sturdy pole to meet local roadside device standards.

To optimize the accuracy of classification, we recommend that the iTHEIA Permanent system camera be installed a minimum of 30 ft (9 m) from the edge of the closest lane. This distance provides the best balance of field-of-view and image quality.

The maximum recommended operating distance of the iTHEIA Permanent system is 150 ft (46 m). Beyond this distance, reduction of image quality may result in degraded classification and the shallow viewing angle will hinder lane discrimination and leave the system more susceptible to occlusion.

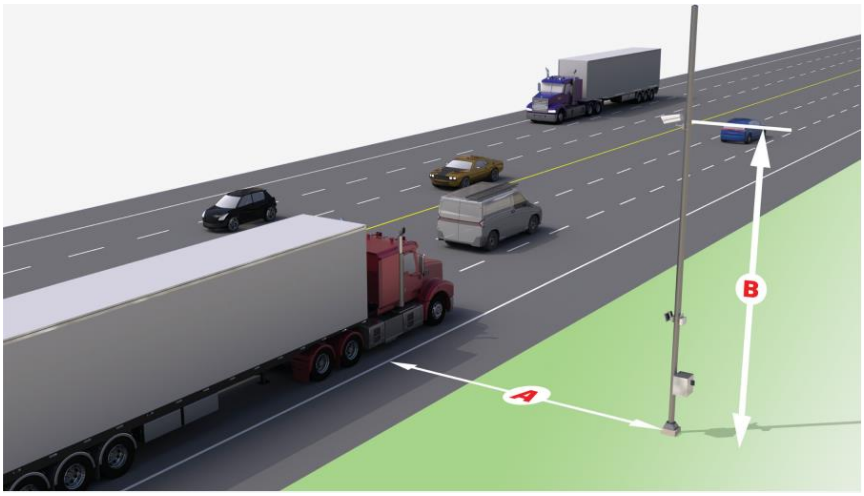
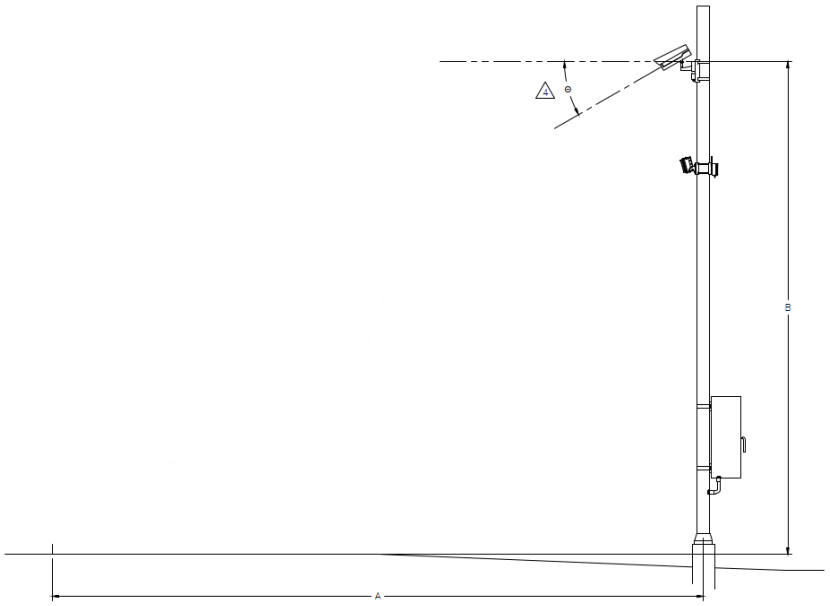


Figure 1 Permanent iTHEIA Geometry

A) Pole Offset Distance - from the painted edge of closest lane of interest to pole
Usually greater than 30 ft (9 m). Maximum operating distance for any lanes must be less than 150 ft (46 m). Each camera can cover up to 70 ft (21 m) of lanes (approx. 6 lanes). A second camera should be used to cover additional lanes.
B) Camera Height
Recommended to be between 25 ft (8 m) to 35 ft (11 m) above roadway surface depending on distance A - pole offset.
Illuminator Height
Recommended to place about 5 ft (1.5 m) below the camera.

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A – POLE OFFSET DISTANCE (FT [m])	B – RECOMMENDED CAMERA MOUNTING HEIGHT (FT [m])	Θ – APPROXIMATE ANGLE (DEGREE)
30 [9.14]	25 [7.62]	40°
50 [15.24]	30 [9.14]	30°
100 [30.48]	35 [10.67]	20°

The system should be installed where the camera has an unobstructed field of view of roughly 90 ft (27.4 m) of all lanes of interest.

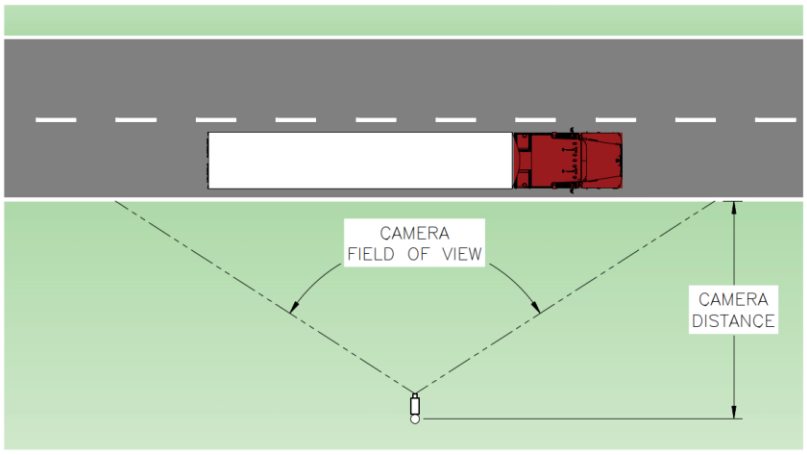


Figure 2 Camera Field of View

For systems where detection of longer vehicles is required, the camera should be installed farther from the roadway. As an approximation, the camera can see a vehicle 3x as long as the distance from the lane (120ft view at 40ft camera distance).

For permanent systems, consideration should be given to ensure adequate useable space for installation equipment such as a drill for the foundation and a crane for pole and camera installation. Finally, ensure there will be safe maintenance access for service technicians.

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