



**IVP CTIS**  
**AUTOMATIC TIRE INFLATION &**  
**DEFLATION SYSTEM**  
**FOR COMMERCIAL VEHICLES**  
**(PATENTED)**

Intelligent Vehicle Products, Inc. (IVP)

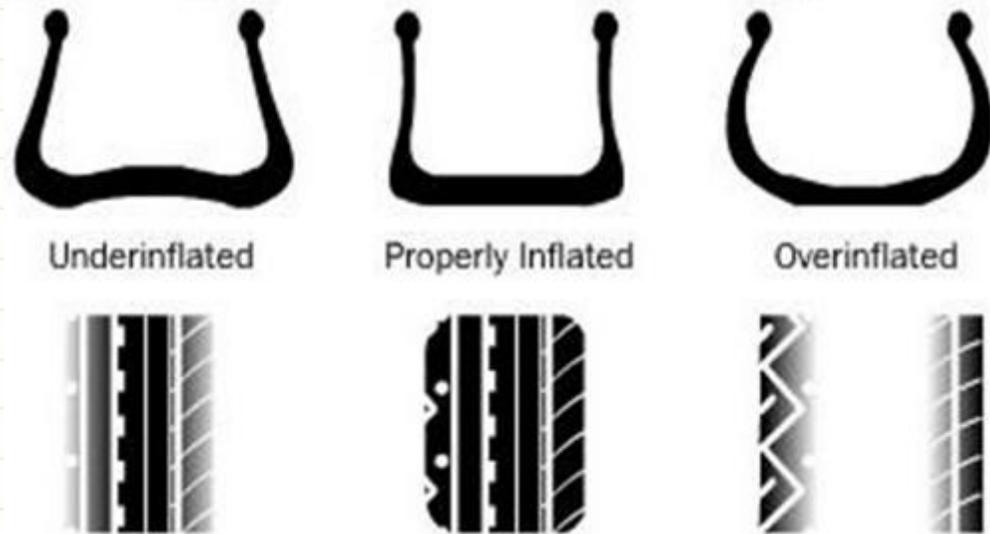
# IVP CTIS Main Features

- Automatically inflate or deflate tires for maintaining optimal pressure
- Automatically equalize pressure for all tires
- Driver selectable tire pressure adjustments with respect to load and road conditions
- Monitor tire pressure in real-time with rapid warnings for abnormal tire conditions such as blowouts and air leaks
- Factory preset pressure parameters are user adjustable
- External mounting for easy of retrofitting



# Importance of Maintaining Optimal Tire Pressure

- Improper pressure caused tire failure is one of the main reasons for vehicle accidents
- Tires worn out much faster on improperly pressurized tires
- Driving on improperly pressurized tires results in substantially poor fuel economy



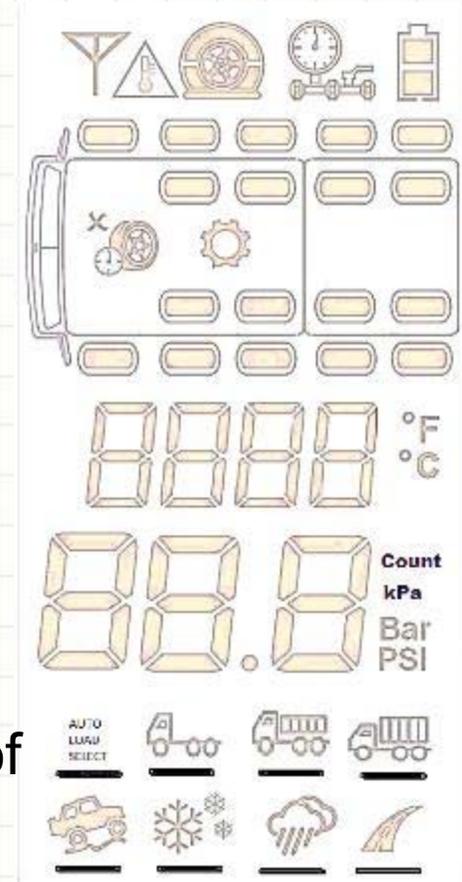
# Benefits of Equalized Tire Pressure

- Decreases tire rolling resistance
- Improves stability and braking
- Maintains even tire tread wear
- Improves overall tire safety
- Maximizes tire life
- Increases fuel economy



# Real-Time Tire Pressure Monitoring

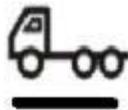
- Continuously monitors vehicle tires in real-time
- Displays tire pressure and temperature readings on the in-cab monitor
- Issues timely warnings of abnormal tire pressure and temperature, such as blowout, air leaks, and overheating
- Enables driver taking corrective action immediately upon being alerted
- Enables driver to detect possible wheel end problems, such as seized brake or broken bearings, by observing readings of rising temperatures
- Facilitates vehicle maintenance with tire information



# Regulate Tire Pressures Based on Load and Road Conditions

- Optimum tire pressure selection for vehicle load and road conditions:

- ❖ Vehicle load: No Load, Half Load, Full Load



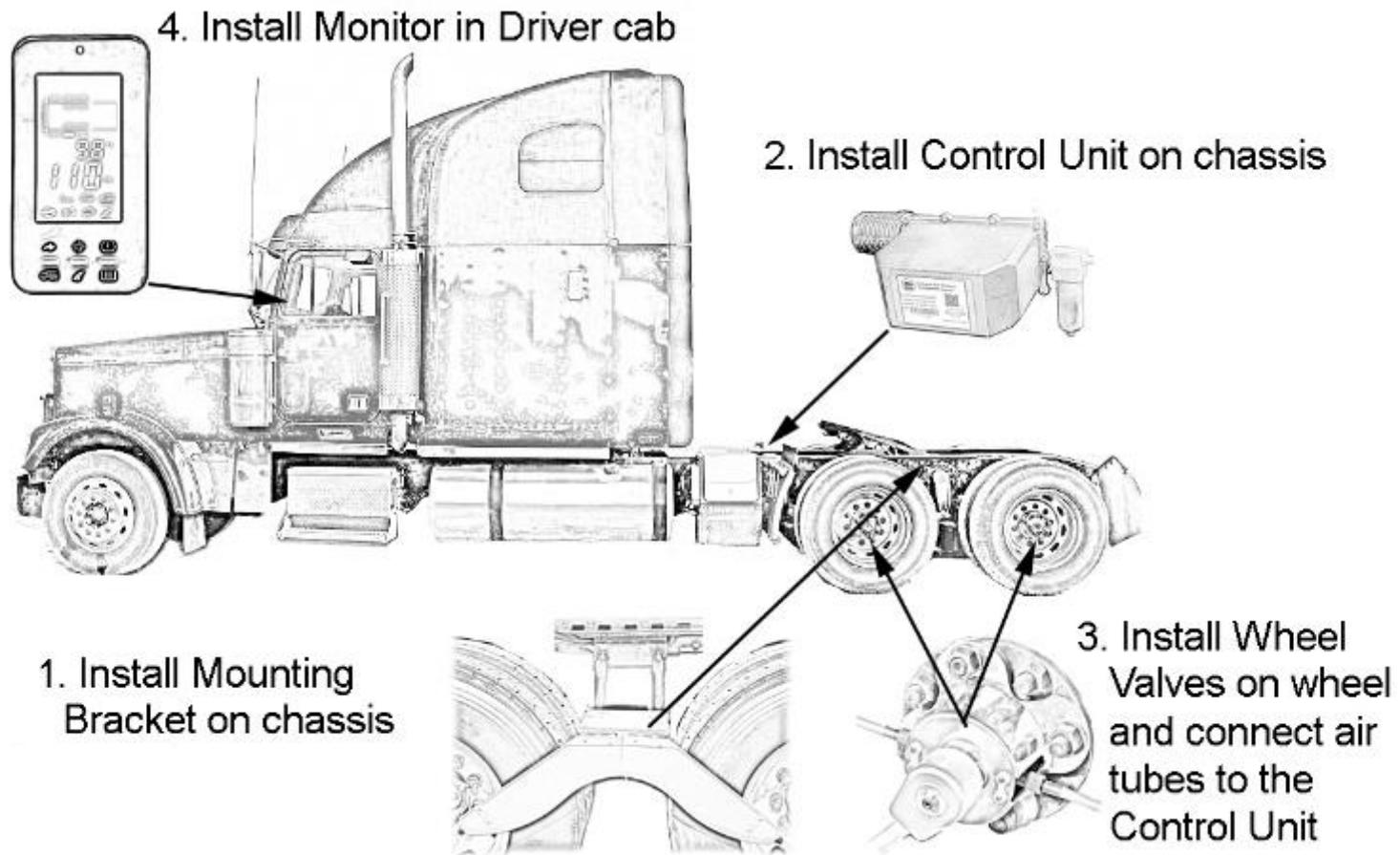
- ❖ Road condition: Slippery, Sandy/Muddy/Snowy, Rainy, Normal



- Benefits:

- ❖ Improves vehicle mobility performance
- ❖ Extends vehicle, tire, drive train and suspension system life by significantly reducing vibration and shock loading

# External Mounting for Easy of Retrofitting

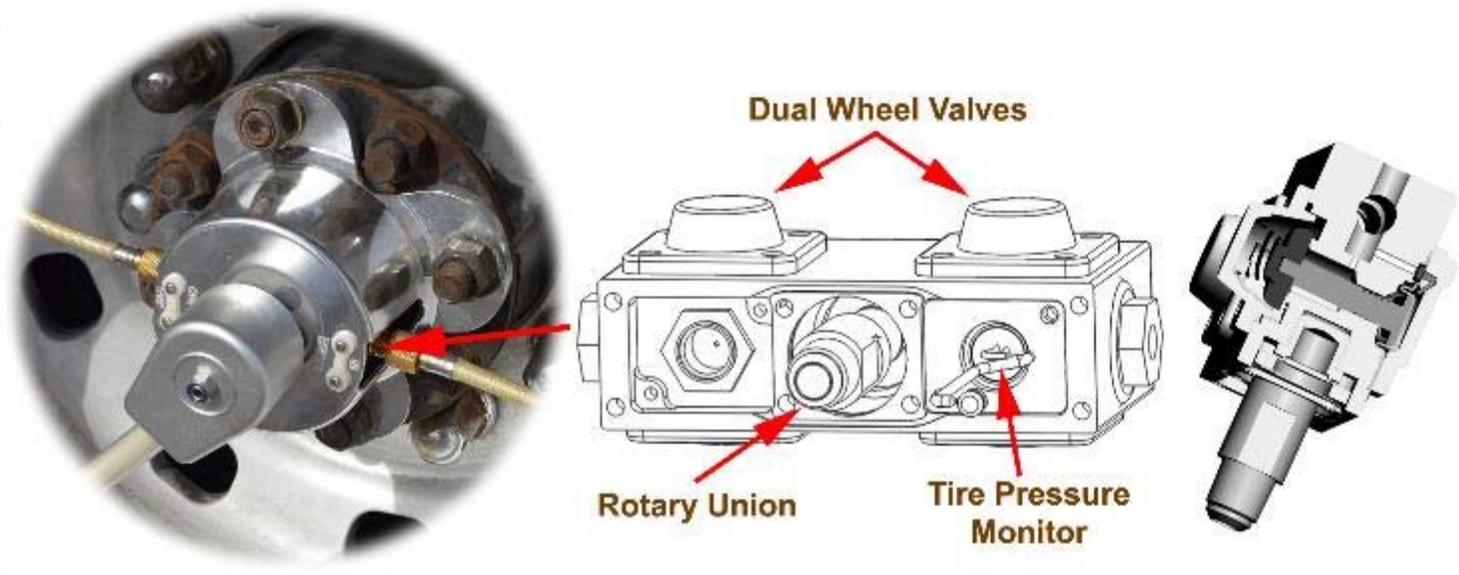


## IVP CTIS Operations

- Operator monitors system information and adjust tire pressures through the in-cab monitor-controller
- On vehicle start up, electronic manifold controller automatically checks out and sets up all dual tires to target pressure through the rotary wheel valve assembly
- System continuously receives real-time tire pressure readings from the built-in wheel valve tire monitor
- System also periodically initiates tire pressure checking
- Based on pressure readings, system may inflate or deflate tires for maintaining equalized target pressure
- While driving, operator may adjust tire pressure settings with respect to load and road conditions
- System alerts operator of any warnings from the wheel valve built-in tire monitor, and maintains pressure during small puncture and leaks
- Upon detection of a flat tire, system will warn the driver and shut off pressure adjustment for that tire

# Leading-Edge Technologies

- The first and only system incorporating electronic tire pressure & temperature monitoring into the wheel valves
- Innovative, patented wheel valve design enables pneumatically actuated valve opening/shutoff with precision over full operating pressure ranges
- Unique hub cap with built-in dual wheel valve assembly supports a set of dual tires



## Leading-Edge Technologies (con't)

- The sophisticated electronic manifold controller is much more advanced than other systems
- The controller assembly has an air chamber, priority pressure sensor, deflation solenoid valve, inflation solenoid valve, quick exhaust solenoid valve with muffler, high accuracy pressure transducer, compressed air filter, and electronics with software controlling the system operations



## Leading-Edge Technologies (con't)

### The Only System Regulates Pressure For Cold/Hot Tires

- When vehicle starts, system checks and sets all tires to cold (ambient temperature) tire target pressure
- When tire temperature and pressure increase while driving, system then gets into **Hot Tire Protection** Mode:
  - ❖ System will maintain tire pressure at a default level of 15 PSI above the cold tire target pressure
  - ❖ Users can adjust this setting to suit their needs
  - ❖ **Hot Tire Protection** preserves the operating characteristics of warmer tire runs with higher pressure than when the tire was cold
  - ❖ **Hot Tire Protection** prevents tire blowout due to hot tire induced excessive pressure build up
- When tires cool down, system will adjust pressure back to cold tire target pressure

## IVP CTIS Enhances Vehicle & Driver Safety

- System maintains proper tire pressure, prevents over-inflation and underinflation, prevents tire overheating, reduces chance of tire blowout
- System equalizes tire pressure, prevents uneven tire tread wear, prevents premature tire wear related tire failures
- System enhances tire's responsiveness, traction and handling, allowing driver to have better control of the vehicle and thus might avoid some accidents
- System load & road conditions related pressure adjustment allows a smoother, less tiring, and therefore safer driving
- System keeps driver informed of tire status in real-time, alerts driver upon detection of abnormal tire conditions, thereby enabling driver to take corrective actions immediately

## IVP CTIS Reduces Fleet Operating Expenses

- Automatic tire pressure maintenance saves the labor cost for manually checking and keeping correct tire pressure
- Properly inflated tires lead to better gas mileage and reduction of fuel expenses
- Properly inflated and equalized tires have much longer life – reducing tire expenses
- Less wear and tear on vehicle due to smoother rides – reducing maintenance costs
- Less vehicle accidents lead to savings in:
  - ❖ Injured people related expenses
  - ❖ Damaged vehicles related expenses
  - ❖ Loss or damaged goods expenses
  - ❖ Insurance premium adjustment expenses

## IVP CTIS – Case Study

Feb. 2015 – Nov. 2017

- Installed IVP CTIS on a 10-tire tractor towing an 8-tire trailer, drove 140,000 miles a year, or about 360,000 miles in 30 months during the study period.
- Before CTIS: needed 2.5 set of new tires costing over \$7,500 a year for the miles driven; those cheap tires only last less than 60,000 miles.
- With CTIS: only replaced tires twice costing about \$6,000 total for the 360k miles; would've spent \$18,000 without CTIS. That's \$12,000 saving over 30 months, or \$4,800/year saving on tire expenses alone.  
**Cheap tires can still last a long life with IVP CTIS.**
- Fuel saving was about 1300 gallon a year, that's about \$3,900 less in fuel expenses.
- As of now the CTIS is still on the truck, working great! Detected a broken bearing by observing readings of rising temperatures, preventing a bad accident.

# Tire Inflate/Deflate Systems Comparison

Features	IVP	PSI	Hendrickson
Tire Inflation	✓ Smart Inflation <= Load, Pressure & Road Cond'	~ Only Inflate To One Fixed Target Pressure	~ Only Inflate To One Fixed Target Pressure
Tire Deflation	✓ Smart Deflation <= Load, Pressure & Road Cond'	✗ Not Available	✗ Not Available
Tire Pressure Monitor	✓ Real Time for Each Tire	✗ Not Available	✗ Not Available
Tire Temperature Monitor	✓ Real Time for Each Tire	✗ Not Available	✗ Not Available
Terrain Select	✓ Hwy, CCY, MSS, EMR	✗ Not Available	✗ Not Available
Vehicle Load Select	✓ Auto/Manual Adjust	✗ Not Available	✗ Not Available
Axle Weight Display	✓ Show Trailer Weight	✗ Not Available	✗ Not Available
Wheel Rotation Counter	✓ Counter for Wheel – Calculate Tire Usage	✗ Not Available	✗ Not Available
Tire Dead Locked Warning	✓ Real Time for Each Tire	✗ Not Available	✗ Not Available
Conclusion	✓ Most Useful For Fleets – Best ROI	~ Limited Usefulness	~ Limited Usefulness