STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

PROPRIETARY PRODUCT CERTIFICATION

630-020-07
SPECIFICATION
08/14

To: Mario Bizzio, PE — Date: 5/11/2018
Design Engineer

Financial Project ID: 437842-1-52-01 — New Const. ☒ RRR ☐
Federal Aid Number: N/A
Project Name: Traffic Adaptive Signal Control Technology: US 17/92 from Monroe Rd. to Minnesota Ave.
State Road Number: SR 15 / SR 600 — Co. / Sec. / Sub.: Volusia County and Seminole County
Begin Project MP: 16.8 — End Project MP: 9.3
Full Federal Oversight: No ☒ Yes ☐ Note: If Yes, submit to FHWA Director.

A justification and all supporting documents must be attached to this document.
Mark the appropriate certification:

"I, Alexander Mims, P.E. 77095 (Print Name of Initiator), 437842-1-52-01 EOR (Position Title), of the Traffic Engineering Data Solutions (Name of Agency),

do hereby certify that in accordance with the requirements of 23 CFR 635.411(a)(2),
Mark appropriately (choose only one option):

☒ *that this patented or proprietary item is essential for synchronization with existing highway facilities.*
☐ *that no equally suitable alternative exists for this patented or proprietary item."*

Alexander T Mims, Date: 2018.05.11 09:40:31-04'00'
Signature *Date*

For Department Use Only

"I, _____ (*Print Name*), _____ (*Position Title*),

of the Florida Department of Transportation, do hereby approve this certification request made in accordance with the requirements of 23 CFR 635.411(a)(2),
Mark appropriately (choose only one option):

☐ *that this patented or proprietary item is essential for synchronization with existing highway facilities.*
☐ *that no equally suitable alternative exists for this patented or proprietary item."*
Identify any conditions and limitations:

_____, _____
Signature *Date*

Traffic Engineering Data Solutions, Inc.

May 11, 2018

Mr. Mario Bizzio, P.E.
FDOT District Five Design Engineer
719 South Woodland Boulevard
DeLand, Florida 32720

Mr. Bizzio,
Please refer to the attached Proprietary Product Certification Form 630-020-07, completed in accordance with Procedure 630-020-005 adopted August 20, 2014. Please also refer to the following justification provided for the use of the proprietary product:

1. Description of project need for the proprietary product.

a. Project Description: This project (FPID 437842-1-52-01) includes the installation of an Adaptive Traffic Control System (ATCS) on 15 intersections along US 17/92 (SR 15/SR 600) in Seminole County and Volusia County; extending the limits of the existing ATCS installed under FPID 435404-1-52-01 currently deployed on the same corridor. The ATCS adjusts traffic signal timings and sequencing based on real-time traffic conditions measured by the system. The ATCS intersection equipment consists of new vehicle detectors mounted to existing traffic signal structures and ASCT processors installed in traffic signal controller cabinets.

b. Existing Conditions and Investment: FPID 435404-1-52-01 installed the InSync ATCS manufactured by Rhythm Engineering at five intersections along US 17/92. The ATCS proposed as part of FPID 437842-1-52-01 (this project) will extend the ATCS southward; adding adaptive control at 15 additional intersections on the same corridor.

c. Compatibility with Existing Equipment: The Rhythm InSync ATCS operates using two separate but coordinated optimization algorithms: the local optimizer and the global optimizer. The local optimizer attempts to reduce individual movement delay at each intersection and monitors the number of queued vehicles in each lane and vehicle time in queue for optimization purposes. The global optimizer's objective is to reduce the number of stops vehicles have to make when travelling along the corridor where InSync is operating by creating "green tunnels" on the mainline through movements for vehicle platoons to travel in. The time between arrival of these vehicle platoons is used by the local optimizer to serve individual movements.

Due to the complex interaction between local and global optimizers, maximum operational benefit will be achieved if the same ATCS system is deployed as part of this project that exists along the corridor—ensuring that the new ATCS deployment will be compatible with the previous investment made by the Department and function as a single, coordinated system. Using the InSync ATCS to extend the existing ATCS will result in synchronized operation along US 17/92, whereas mixing adaptive solutions has the potential to create unpredictable interactions that negatively affect traffic flow.

As the project spans maintenance jurisdictions—both Seminole County and Volusia County—two different traffic signal controller types are present. The InSync solution is controller agnostic, meaning it is compatible with both controller types. Retaining the same controller types will maintain functionality of each County's TMC to monitor and manage traffic operations on the corridor: each operates a traffic signal central management software that is only compatible with particular traffic signal controllers.

80 Spring Vista Drive ● DeBary, Fl 32713 ● Phone 386.753.0558 ● Fax 386.753.0778
www.teds-fl.com

d. Proprietary Product Description: The Rhythm InSync ASCT consists of the following main components:

   i. InSync Detection Camera (optical or thermal) – provides vehicular detection capable of per lane queue measurement.

   ii. InSync Processor - gathers data and determines which vehicular movements to serve then passes this information to the traffic signal controller.

   iii. InSync Equipment Panel - power and communication hub for the intersection equipment.

   iv. InSync SDLC Intercept Module - provides connections for NEMA TS1 and NEMA TS2-Type 2 controllers and the InSync Processor.

   v. InSync DIN Relay – permits remote power cycling of the Detection Cameras.

   vi. InTraffic Central Command Console – central management software for InSync ATSC.

2. Factual and technical supporting evidence for synchronization.

a. Function: The proprietary product is necessary to ensure compatibility and predicable interaction with the existing ASCT on US 17/92.

   i. A product brochure for the system is attached (Exhibit A).

   ii. This product is installed at five intersections on US 17/92 immediately to the north of this project.

b. Logistics: The proprietary product is familiar to the signal maintaining agencies: Volusia County and Seminole County. Additionally, FDOT District 5 currently operates this system on this and other corridors in the region.

   i. This product is already in use and is guaranteed to be interchangeable with existing maintenance inventory.

   ii. Traffic signal technicians are familiar with the maintenance, deployment, and functionality of this product.

   iii. Traffic Management Center (TMC) operators in Volusia County and Seminole County are familiar with how this system interacts with their traffic signal system. Both agencies have InSync deployed on corridors where they are responsible for traffic signal system management and operation.

   iv. Regional Traffic Management Center (RTMC) operators with FDOT District 5 are familiar with this system's operation and no new central software installation is required.

c. Training Costs:

   i. Traffic signal maintenance staff is familiar with this product as it is deployed throughout the area. No additional training costs are anticipated.

   ii. Volusia County and Seminole County TMC operators are familiar with the system's operation and interaction with their traffic signal systems. No new training is anticipated.

   iii. RTMC Operators are familiar with operating the system. No new training is anticipated.

d. Software Development Costs:

i. No new software development is required as InSync is already being operated from the FDOT District 5RTMC.

ii. The InSync system is compatible with traffic signal controllers present along the corridor. No new drivers or other software will need to be developed to provide compatibility between the traffic signal controllers and ASCT.

3. Explanation how the evidence links the proprietary product to the project need.

a. The US 17/92 corridor experiences unpredictable traffic demand caused by non-recurring congestion commonly resulting from I-4 incident related traffic diversions; therefore, the corridor was selected for ATSC. Under FPID 435404-1-52-01, completed in 2015, Rhythm Engineering's InSync ATSC system was installed and is currently operational.

4. Factual and technical supporting evidence that no alternatives are available.

a. In order to ensure compatibility with the existing ATSC operational along the corridor, the same solution must be used. Use of the InSync ATSC will ensure compatibility.

b. At this time, there are no alternatives that guarantee compatibility with the existing ATSC installed on the US 17/92 corridor that this project is extending.

If you have any questions, or need additional information, please contact me at (386)753-0558 or via email at amims@teds-fl.com.

Sincerely,
TRAFFIC ENGINEERING DATA SOLUTIONS, INC.

Alexander T Mims Date: 2018.05.11 09:40:49-04'00'

Alexander T. Mims, P.E
Project Engineer

EXHIBIT A

RHYTHM ENGINEERING

In|Sync®

REAL-TIME
ADAPTIVE TRAFFIC SIGNAL SYSTEM

PRODUCT CATALOG

www.rhythmtraffic.com

EXHIBIT A

Reggie Chandra, Ph.D., PE
Lead Traffic Engineer + CEO

Dear fellow traffic professionals,

In 1993, I started practicing as a traffic engineer with the City of Springfield, MO. I was working with PASSER 2 and TRANSYT-7F on a 486 DOS machine cranking out timing plans. (I am dating myself and a select few probably still remember the technologies.)

In 1995, you needed a dedicated pair of fiber-optic cable in order to bring video feed from a CCTV camera back to a Traffic Management Center. Technology has come a long way since then. Now, you can cram the entire data needs of a city into a pair of fibers!

Unfortunately, the traffic industry has not kept up with the changes in technology.

I didn't for the life of me think that after 2.5 decades, I would be where I am today. Leading the traffic signal technology charge with a team of **dreamers**.

Passionate and relentless **dreamers** who are attempting to make a positive difference to the way traffic flow is managed in the United States and Canada.

Here is our **promise** to you.

We will not rest or passively stand by watching as lack of technology negatively affects traffic flow in North America.

We will not rest till every traffic professional in North America is provided with effective tools to manage their traffic signals.

This is our promise.

Very respectfully,

Reggie Chandra

The information in this document was reviewed and published in January 2018.

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EXHIBIT A

The **In|Sync** Model

The **In|Sync** system delivers **40% more effectiveness** and performance measures than any existing system that optimizes traffic signal coordination. This fact has been proven by over three dozen independent validation studies.

These improvements can be attributed to the three distinct modules that seamlessly work together inside the **In|Sync** model.

Module #1: Digitize Traffic Signal Operations

All other existing traffic signal synchronization methodologies work off of the concept of common cycle lengths. A cycle length is an emulation of the dial in an electromechanical controller and therefore analog in nature.

The two major issues with common cycle lengths are that:

1. Vehicles have to wait on the side streets even when there is no one on the main street.
2. Signal transition. This happens when a signal skips phases and is in a state of chaos as it changes timing plans or after a signal preemption.

In|Sync does not use common cycles. Unlike all other existing traffic-signal models, it uses the concept of **states**.

Examples of states (phase pairs)

Example of a sequence

A state is a pair of concurrent phases that can be green simultaneously without conflict. **In|Sync** differs from the sequential and set nature of phases in a cycle, because it can invoke any state as and when needed.

The difference is very much like the difference between the **old TV channel selector and the modern remote control**. With the old, you had to click your way sequentially through each channel before you could select the channel you wanted. With the modern remote control, you can directly select the channel you want by typing its number.

Electromechanical controller

The benefit of having a digital architecture is that green time is not wasted serving empty phases and there is no transition between timing plans.

In|Sync processor, a digital state machine

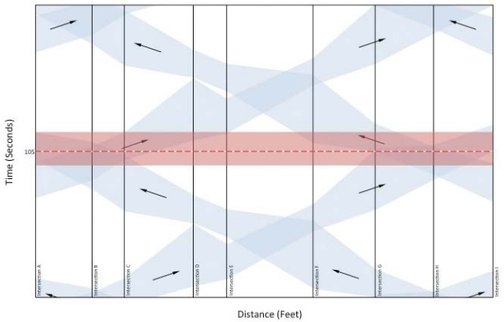
Module #2: Local Optimization

In|Sync uses a rule-based Artificial Intelligence (AI) algorithm to compute real-time green durations to vehicle demand at each local intersection.

In|Sync knows the duration of wait times for every vehicle near the stop bar and the queue length for every lane. This information is collected **every second in real-time**. **In|Sync allocates a token** for every unique car that joins the queue. An additional token is given to each car that waits every 5 seconds.

The Greedy Algorithm changes the traffic signal light status to minimize the number of tokens issued. Thus, the local optimizer considers the number of cars waiting (real-time demand) and how long they have been waiting (delay).
This patented algorithm does not use out-dated Webster-equation based modeling and is proven to produce unparalleled results in the field.

Module #3: Global Optimization



In|Sync guarantees coordination between traffic signals (even unevenly spaced traffic signals) without increasing side street delay using a concept called "**Time Tunnels**."

Time tunnels are created throughout the corridor (or grid network) with the slope of the tunnel indicating the speed of travel between traffic signals.

The scheduling of green for the coordinated phases are the top priority for the **In|Sync** model. The coordinated phases are guaranteed to be green along the speed line and all other movements are scheduled around this.

The **point of initiation of green** for the coordinated phases are the **only fixed points** in the signal operation and all other points in time are **floating**. The tunnels can have variable duration based on demand or can be programmed to have a minimum green duration. The tunnels can be truncated based on demand, the green durations for various phases are based on the Greedy Algorithm, and the time-between-tunnels can vary as well. All of these processes happen in **real-time**.

In|Sync Model Captured in One Sentence

The In|Sync model gives you the power to turn your coordinated movements green when you want them to be green and the rest of the time the signal operates in free/actuated mode (with the local optimizer running the Greedy Algorithm).

EXHIBIT A

Benefits of **In|Sync**

1

Proven to reduce crashes by 15%-30%[5, 12, 13, 20]

Multiple independent validation studies have proven that **In|Sync** reduces crashes significantly through the corridor. The studies show that angular crashes as well as rear-end crashes are reduced.

2

Proven to reduce delay by 73%[2-21]

Studies have proven that **In|Sync** significantly decreases main street delay by enhancing progression and reduces side street delay by reducing the wait times and queues (Local Optimizer).

3

In|Sync is compatible with all existing hardware (cabinets and controllers) and software (central system software)

In|Sync is highly versatile and can be configured for any controller or cabinet available on the market.

4

Vehicle emissions and fuel consumption reduce by 34%[2-21]

The impact to the environment and reliance on fossil fuels are immediate and impressive. Agencies that are combating air pollution are deploying **In|Sync** as a solution to improving air quality.

5

Proven to reduce vehicle stops by 80%[2-21]

In|Sync's Global Optimizer creates guaranteed time tunnels between traffic signals. The digital architecture is capable of creating unparalleled progression between traffic signals.

6

In|Sync does not require installation of additional vehicle detectors

In|Sync comes with its own vehicle detection and data collection system. It is a complete package without the need for installing additional detection devices.

7

In|Sync is the ONLY real-time adaptive traffic signal system in the market [1, 16]

In|Sync provides real-time analysis and operations.
Its dynamic optimization algorithms serve traffic based on real-time demand and delay analysis.
Thus **In|Sync** makes adjustments to green splits, sequences and time between tunnels, instantly.

8

Proven to consume the least amount of human intervention and staff time[16]

The adoption rate of **In|Sync** in the USA proves this point.
Agencies without sufficient and dedicated staffing for traffic signal operations select **In|Sync** to manage their traffic signal operations.

9

24/7/365 remote support directly from the manufacturer of the technology in the USA

Help is just a phone call away and when you need it.

10

Transition between timing plan changes and after preemptions are eliminated

This is one of the benefits of the digital architecture. With **In|Sync** wasted green times are a thing of the past.

11

Vehicles do not wait on side streets when there is no demand on the main street

In|Sync's digital architecture does not waste time by providing green to traffic movements without demand. This game-changing (Local Optimizer) technology is used daily in controlling traffic in some of the most congested intersections in the USA.

12

Proven to have the least amount of down time compared to other similar systems[16]

99% of **In|Sync** systems that have been sold are operational. The extensive failure mitigation systems keep your corridor operational. **In|Sync** can effectively mitigate detection, communication and hardware failures.

13

Progression is guaranteed between signals even when the traffic signals are unevenly spaced

In|Sync's patented Global Optimizer guarantees efficient progression between systems. The longest system is 9 miles long, 26 traffic signals on a roadway that spans 2 cities, 2 counties and 2 states.

14

In|Sync is a product and not a project

Deploying **In|Sync** is like installing a detection system. Once installed, the adaptive operation can be fully turned on in as little as 2 weeks. The process is so painless that Rhythm engineers are turning on 1 corridor somewhere in the USA every single week.

1. Adaptive Control System Recommendation. In *Adaptive Control System Review.* (2016). Iteris

2. *Adaptive Traffic Control Test System Evaluation.* (2014). Urban Systems Associates

3. *Adaptive Traffic Signal Control System. Before & After Travel Time and Delay Study.* (2011). HDR Engineering

4. Barrera, J. R. (2015). *In|Sync Adaptive Signal Control Technology. Effectiveness Study.* AECOM

5. Bollinger, G. (2010). *Evans, Georgia. Case Study.* Columbia County, GA

6. Brian R. Keaveney, B. R. (2010). *Traffic Signal System Comparison. Route 202 and Gulph Road/Mall Boulevard. Upper Merion Township, Montgomery County.* Pennoni Associates

7. Elefteriadou, L., Martin-Gasulla, M., & Manjunatha, P. (2017). *Before and After - Implementation Studies of Advanced Signal Control Technologies in Florida.* Transportation Institute, University of Florida

8. *Evaluation of Main Street Adaptive Traffic Signal System For the City of Salinas.* (2011). TJKM Transportation Consultants

9. Fontaine, M. D., Ma, J., & Hu, J. (2015). *Evaluation of the Virginia Department of Transportation Adaptive Signal Control Technology Pilot Project.* Virginia Center for Transportation Innovation & Research

10. Hathaway, E., Urbanik, T., & Tsoi, S. (2012). *Transportation Operation Innovation & Demonstration Evaluation/Statewide.* Kittelson & Associates

11. Hatton, C. C (2012). *In|Sync Evaluation Before and After Study. Pinellas County, Florida.* Kimley-Horn and Associates

12. Hutton, J. M., Bokenkroger, C. D., & Meyer, M. M. (2010). *Evaluation of an Adaptive Traffic Signal System: Route 291 in Lee's Summit, Missouri.* Midwest Research Institute

13. Janczys, D. (2010). *Springdale, Arkansas. Case Study.* City of Springdale, AR

14. Nichols, A. P. (2012). *Travel Time Evaluation of Teays Valley In|Sync Deployment.* Rahall Transportation Institute
Marshall University

15. *San Ramon Adaptive Signals Study.* (2010). DKS Associates

16. Selinger, M., & Schmidt, L. (2010). *Adaptive Traffic Control Systems in the United States: Updated Summary and Comparison.* HDR Engineering

17. *Shoreline Adaptive Signal System Final Corridor Performance and Evaluation Report.* (2016). TJKM Transportation Consultants

18. Stevanovic, A., & Zlatkovic, M. (2012). *Comparative Evaluation of In|Sync and Time-Of-Day Signal Timing Plans Under Normal and Varied Traffic Conditions.* Florida Atlantic University

19. *10th Street Adaptive Signal Timing. Evaluation of In|Sync System Implementation.* (2012). Atkins

20. Voss, L. (2011). *Topeka, Kansas. Case Study.* City of Topeka, KS

21. *ZOO Interchange Adaptive Signal System. WIS 100 In|Sync Adaptive Signal Study.* (2013). TranSmart Technologies

Performance

The #1 Adaptive Traffic Signal System in the U.S.

In|Sync is a **real-time adaptive** traffic signal control solution. It is deployed by more traffic agencies in the United States than any other adaptive technology. This is because the patented, award-winning **In|Sync** system enables traffic signals to synchronize in **real-time**.

Numerous independent studies from various engineering firms confirm that **In|Sync** delivers measurable benefit several times greater than other adaptive traffic control solutions and other approaches to signal synchronization.

By combining **real-time** data collection with **real-time** signal optimization, it is proven that **In|Sync** dramatically reduces stops, delays, travel time, fuel consumption, vehicle emissions and most importantly, crashes.

Independent Validation of In|Sync Performance

Independent studies from engineering firms and universities confirm **In|Sync** delivers measurable benefits several times greater than other adaptive systems and other approaches to signal synchronization.

The third-party organizations that have evaluated **In|Sync** include:

- AECOM (Farmington, NM)
- Atkins
- DKS Associates
- HDR, Inc.
- Kimley-Horn and Associates
- Kittelson & Associates
- Lee Engineering
- MRIGlobal
- Olsson Associates
- Pennoni Associates Inc.
- Rahall Transportation Institute, Marshall University
- Dr. Aleksandar Stevanovic, Florida Atlantic University
- TJKM Transportation Consultants
- Virginia Center for Transportation Innovation & Research (Virginia DOT)
- University of Florida Transportation Institute
- University of Kentucky Transportation Center

For more information on the system's intelligence, model and performance and to access these complete before-and-after studies, please visit ***rhythmtraffic.com/resources***.

EXHIBIT A

Community *Source*	Reduced Stops	Reduced Delay	Reduced Travel Time	Reduced Emissions	Increased Average Speed	Annual Savings to Motorists
Columbia, MO *MoDOT, MO, 2010*	90%	77%	29%	25%	41%	$1.9 Million
Columbia Cty, GA *Columbia County, GA, 2012*	100%	82%	48%	39%	93%	$2.9 Million
Farmingtion, NM *AECOM, 2015*	100%	97%	35%	29%	51%	$1.1 Million
Greeley, CO *Atkins, 2012*	52%	37%	11%	NA	13%	$1.3 Million
Lee's Summit, MO *MRIGlobal, 2010*	95%	87%	39%	50%	62%	NA
Mountain View, CA *TJKM Transportation Consultants, 2016*	40%	39%	28%	NA	NA	NA
Mt. Pleasant, SC *HDR, 2011*	56%	NA	23%	NA	NA	NA
Pinnelas Cty, FL *Kimley-Horn, 2012*	74%	77%	31%	22%	45%	NA
Pinnelas Cty, FL *Transportation Institute, UF, 2017*	NA	12%	15%	NA	NA	NA
Richmond, VA *VCTIR, 2015*	100%	94%	55%	52%	120%	NA
Salinas, CA *TJKM Transportation Consultants, 2011*	91%	89%	46%	NA	84%	$1.7 Million
San Diego, CA *Urban Systems Associates, Inc., 2014*	59%	NA	17%	27%	17%	NA
San Ramon, CA *DKS Associates, 2010*	82%	99%	50%	38%	94%	$1.3 Million
Springdale, AR *City of Springdale, AR, 2010*	95%	86%	42%	35%	73%	$5.1 Million
State of Virginia *VCTIR, 2015*	68%	NA	37%	NA	59%	$33.4 Million
Teays Valley, WV *RTI, Marshall University, 2012*	NA	NA	33%	NA	NA	NA
Topeka, KS *City of Topeka, KS, 2011*	100%	78%	49%	47%	96%	$2.1 Million
Upper Merion, PA *PennoniAssociates, 2010*	100%	89%	26%	30%	35%	$795,000
Volusia Cty, FL *Aleksandar Stevanovic, PhD, PE, and Milan Zlatkovic, PhD, 2012*	NA	17%	13%	NA	17%	NA
Washington Cty, OR *Kittelson & Associates, Inc., 2012*	NA	NA	20%	NA	NA	NA
Wauwatosa, WI *TranSmart Technologies, Inc., 2013*	32%	28%	10%	10%	NA	$1.3 Million
Wichita, KS *City of Wichita, KS, 2011*	100%	89%	44%	42%	78%	$975,000

EXHIBIT A

Testimonials

"Since the new signals were installed, we've seen travel times reduced by as much as 25% during rush hour. We've also seen the number of stops at these traffic signals decrease by as much as 53%, depending on the signal. We have residents and commuters who travel this corridor every day — and they've definitely noticed an improvement."
Kevin Faulconer
Mayor of *San Diego, CA*

"The results of their equipment is instant. The minute you turn it on the results are there. Within five minutes of turning on our initial system traffic completely changed on our main corridor."
Matt Schlachter, PE
Deputy County Administrator, Construction & Maintenance | *Columbia County, GA*

"This year it seemed to be a much smoother (traffic) flow than we've had before."
Randy Tennison
Senior General Manager for Jordan Creek Town Center | *West Des Moines, IA*

"Everything we've been hearing about **In|Sync** is positive…which is always good as we get less calls, and that generally means your system is working pretty good."
Justin Hall
Public Works Division Manager | *Winchester, VA*

"It's real-time! When you have an influx of traffic, it takes care of that traffic immediately!"
Jim Dickinson, PE
Principal Engineer - Traffic | *West Des Moines, IA*

"The number of stops is way down, the congestion is way down, and it's a lot safer."
Linda Voss, PE
Traffic Engineer (fmr) | *Topeka, KS*

"After implementing **In|Sync**, we saw most of all our corridors had very positive results, and we saw decreases in the travel time."
Michael Clements, PE
Traffic Systems Manager, Virginia DOT
Richmond, VA

"Tomorrow's technology is here today, so let's see what it can do. **In|Sync** has proved to be something worth your time and investment."
Larry Haas, PE
Traffic Operations Engineer, CDOT | *Greeley, CO*

"We got rave reviews not only from the public officials, but from the motorists as well."
Ashwin Patel, PE
District Traffic Engineer, Pennsylvania DOT
Philadelphia, PA

"We have seen a clear improvement in traffic flow, and we anticipate a significant reduction in crashes. Thanks for a job well done."
Donald DeBerry, PE
City Transportation Engineer | *Lynchburg, VA*

"The system is doing a great job of moving traffic through the corridor."
Dub Janczys
Signalization Supervisor (fmr) | *Springdale, AR*

"The system itself is very smart and addresses issues as they come up."
Brad Morrison
Transportation Director | *Mt. Pleasant, SC*

"It's like having several [extra] traffic engineers on staff."
Glen Bollinger, IMSA3
Traffic Engineer (fmr) | *Augusta, GA*

"There are many time periods and commuters that are benefiting tremendously."
Eric Kinard
Signals and Congestion Management Supervisor, Penn DOT District 8 | *Harrisburg, PA*

"They were there every step of the way in telling us what we would need. They were incredibly helpful in working with the different vendors."
Eric Bracke, PE, PTOE
City Traffic Engineer (fmr) | *Greeley, CO*

"It's not like a traditional signal where the main line is first, then the turns. Here, it's going to decide it's easier for me to serve the left turn movement before I let everyone else through."
Alex Martinez
Senior Traffic Studies Specialist, MoDOT
Kansas City, MO

"Putting the adaptive system in, we gained efficiency and reduced the cost. It was a win–win, no doubt about it."
Bret Hodne
Public Works Director | *West Des Moines, IA*

"We found that **In|Sync** significantly improved operations on the corridors, and we typically saw improvement in main line travel time. We also saw improvement on travel time reliability. On the safety side, we looked at 47 intersections around the state. On average, we saw a significant reduction of 17% in total crashes."
Michael D. Fontaine, Ph.D., PE
Associate Director for Safety, Operations, and Traffic Engineering, VTRC
Charlottesville, VA

"**In|Sync** was the first system that we saw that had a whole new approach… And we feel that it's the best adaptive traffic control solution currently on the market."
Justin Schlaefli, PE, TE, PTOE
President, Urban Systems Associates
San Diego, CA

"The installation of these new adaptive traffic signals means less time spent on the road and more time for commuters to spend with their families. Residents are catching more green lights than ever before and the community is thrilled about it."
Lorie Zapf
City Council Member | *San Diego, CA*

"Since **In|Sync** was installed, the report shows, we have a 90% reduction in stops, travel time has improved by 30%, fuel consumption is down 20%, and emissions (are) down 30%. I'm impressed."
Tom Evans, PE,PTOE
District Traffic Engineer (fmr), MoDOT
Kansas City, MO

"When cars stop less often, the likelihood for crashes also decreases. More smoothly flowing traffic makes for safer commutes and a healthier community."
Matt Burns
Police Chief | *Sioux Falls, SD*

"I looked into it, and what attracted me the most was that it was real time coordination. It's just unbelievable – I drive from there every day now."
Gigi O'Donnell
Traffic Signal Supervisor | *Charlottesville, VA*

"This technology is different than any other system operating today. It addresses limitations and deficiencies that nearly every traffic control system has. For a long time, traffic engineers have been hoping for a significant innovation in traffic control and here it is."
Matt Selinger, PE, PTOE
Transportation Program Manager, Omaha, NE

"Since the **In|Sync** system has been put in, I might not get stopped one time in a whole series of signals, which to me is phenomenal!"
Eddie George
Traffic Supervisor | *Aiken, SC*

"Any time you call them, they are there to help and guide you step-by-step."
Charles DeVitis, IMSA3
Traffic Signal Supervisor
Upper Merion Township, PA

"Traffic flow has improved and is at least 40% more efficient."
Terry LaFleur
Communications Systems Manager
Beaumont, TX

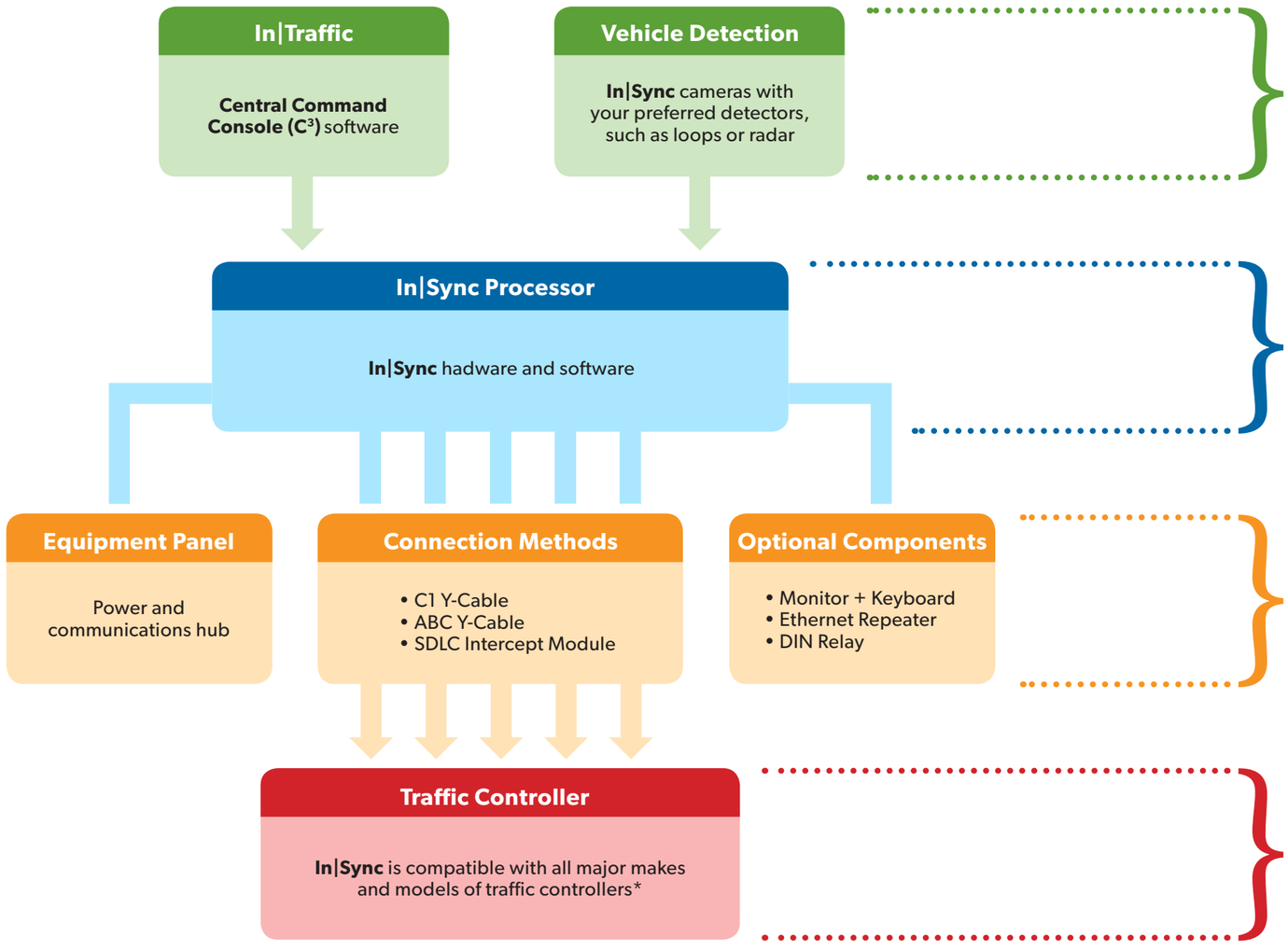
"Unlike older technologies, **In|Sync** can adjust to immediate changes in traffic… **In|Sync** looks at exactly what is currently happening and immediately adjusts to an unexpected change in traffic. It's impressive to see how quickly the system adapts."
Bill Henry, PE
Traffic Engineering Manager | *Little Rock, AR*

EXHIBIT A

Our Partners

Architecture

EXHIBIT A



Inputs Layer

In|Sync accepts data from multiple sources to analyze traffic conditions at the intersection and along the corridor every second.

Real-time, Artificial Intelligence-based Optimizer Layer

The **In|Sync Processor**, installed in the traffic cabinet at each intersection, constantly decides how to best optimize traffic flow at the intersection in real-time, while also coordinating progression along the corridor. **In|Sync** does not depend on a central server; rather, intelligence resides at each cabinet and interacts with the corridor's network of all **In|Sync Processors**.

Auxiliary Equipment Layer

These components provide the power, Ethernet and intra-cabinet connectivity that **In|Sync** requires. Rhythm Engineering provides one-on-one guidance to help you choose the auxiliary components that best integrate with your existing equipment and support your adaptive traffic control goals.

Your Traffic Controller and Signals

Your traffic controller runs in free mode so it can accept calls from **In|Sync**.
In|Sync enables your traffic signals to adapt to real-time demand.
In|Sync is compatible with all models of traffic signal controllers.

* - Any controller other than electro-mechanical

Models

EXHIBIT A

Comparison of In|Sync Models

All In|Sync systems include the following (per intersection):

- 1 **In|Sync Processor**
- Up to 4 cameras for vehicle data collection
- 1 Equipment Panel for power and Ethernet connectivity
- Connection to controller
  (choose from C1 Y-Cable, ABC Y-Cable, SDLC Intercept Module)
- **In|Traffic** software and access to the **In|Sync WebUI** to configure, monitor and manage traffic flow
- One-year hardware and software warranty
- One year of remote technical support available 24/7/365

In|Sync

Vehicle Detection

Video detection data collection provided by Rhythm Engineering

Benefits

Monitor live camera views of your intersections via any web browser

In|Sync: FUSION

Vehicle Detection

We integrate both our detection and your existing detection devices

Benefits

Nearly 100% error-free detection accuracy, by using multiple detection sources

In|Sync: FIRE

Vehicle Detection

A specialized enclosure offering additional thermal elements to **In|Sync**'s cameras for use in the harshest winter environments

Benefits

Additional heating elements effectively prevent the accumulation of ice or snow in camera lenses

In|Sync: THERMAL

Vehicle Detection

Uses thermal imaging for vehicle detection

Benefits

Thermal imaging and heat-signature detection eliminates the effect of inclement weather and conditions such as sun glare, shadows, rain, fog

In|Sync Processor

EXHIBIT A

Overview

The processor is the heart of the **In|Sync** system. This environmentally hardened computer, installed in the traffic cabinet at each local intersection, holds all the artificial intelligence of the adaptive system. The **In|Sync Processor** gathers detection information from all sources available (cameras, loops, pedestrian push-buttons, etc.) and then determines the service priority for each approach. The processor places only two concurrently serviceable phases (state) to the existing traffic controller to actuate signal phases.

As a modern, **digital state machine**, the processor can choose whichever state will best serve traffic demand. **In|Sync** then sends the appropriate detector call to your controller and the signals adapt to traffic demand immediately. **In|Sync** transforms the complexity of constantly changing traffic demand into simple decisions made every second, resulting in a noticeable difference to you and your motorists.

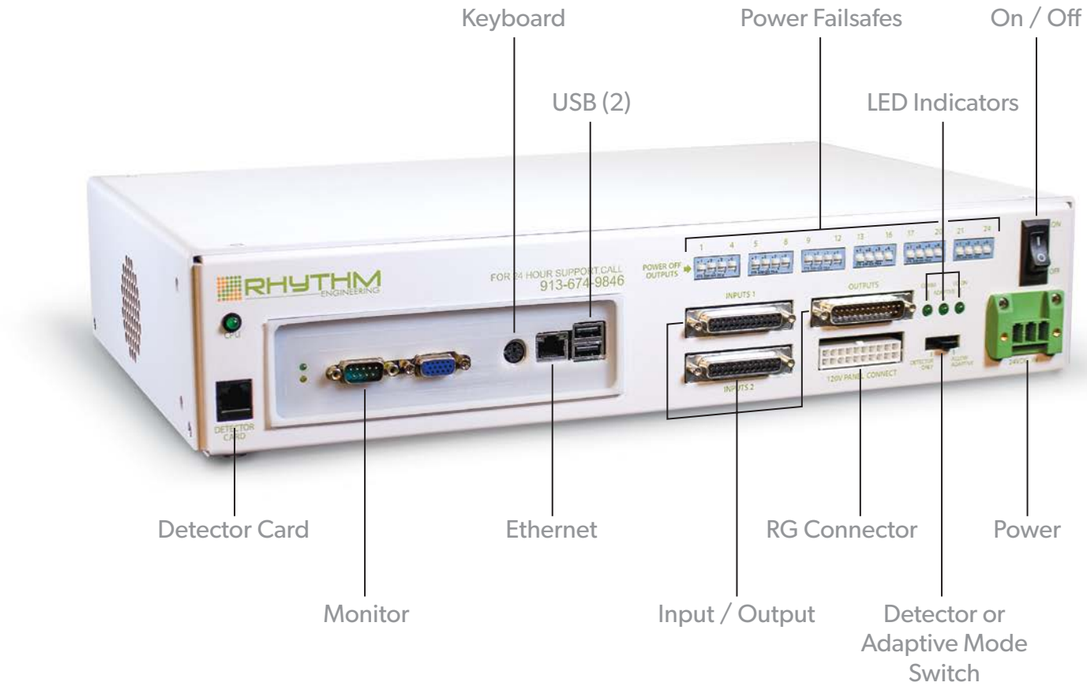
NEMA-STYLE

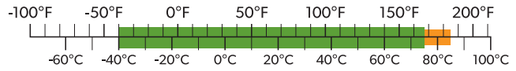
330s-STYLE

Features

- Video processing for up to 5 networked **In|Sync** cameras
- Remote monitoring / configuration via a web interface
- Tied to the cabinet, enabling monitoring of light status
- Password protection for access on shared networks with multiple levels of credentials
- Automatic per-phase and per-lane traffic counts
- Advanced emergency / fog mode based on historical data with In|Sync cameras
- VGA video port for monitoring at cabinet
- 2 USB ports for keyboard/mouse and field upgrades
- 10/100 Mbps Ethernet port
- Compatible with all types of traffic controllers and cabinets for fast, easy installation
- Flexible and extensive input/output options for advanced functionality

In|Sync Processor Connectivity





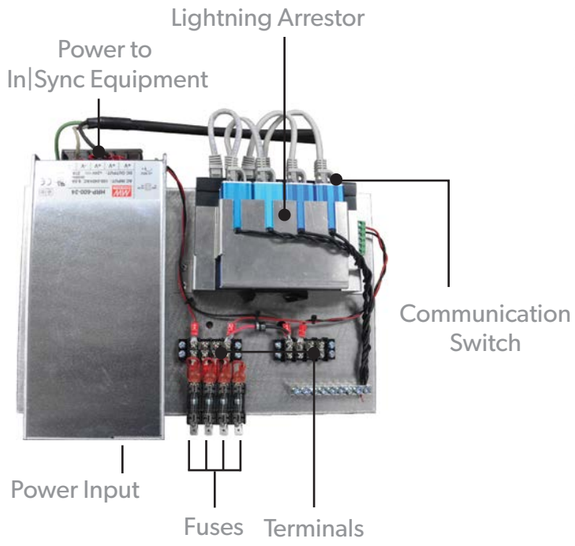
Power	Weight	Temperature	Humidity	Dimensions
24VDC, min 150 W	7 lb (3.2 kg)	**Operating:** -40°F to 165°F (-40°C to 74°C) **Non-Operating:** -40°F to 185°F (-40°C to 85°C)	Operating: 10% to 90% non-condensing Non-Operating: 5% to 95% non-condensing	**330s-STYLE:** 19" STANDARD RACK MOUNTABLE 16.75" W x 9.5" D x 3.25" T (426mm W x 241mm D x 82.6mm T) **NEMA-STYLE:** SHELF MOUNTABLE 5.9" W x 9.5" D x 10.8" T (150mm W x 241mm D x 275.5mm T)

EXHIBIT A

Equipment Panel

Overview

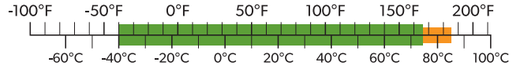
The Equipment Panel is the power and communications hub of the **In|Sync** system at each intersection. It provides an environmentally hardened DC power supply and an Ethernet switch, both of which support the **In|Sync Processor** and cameras.



The Equipment Panel has a number of safety mechanisms, including lightning arrestors to protect the networking equipment and a fuse block to protect the power leads to the cameras.

Features

- Hardened 120 VAC to 24 VDC 600 watt power supply
- 100 Mbps unmanaged Ethernet switch
- Store-and-forward switching architecture
- 8 Ethernet networking ports
- DC+/DC- terminal blocks provide power to cameras
- Earth ground bar
- Lightning arrestors to provide surge protection
- 4-amp fuse block protects power to the cameras



Power	Weight	Temperature	Humidity	Dimensions
120 VAC; max 160W	7 lb (3.2 kg)	**Operating:** -40°F to 165°F (-40°C to 74°C) **Non-Operating:** -40°F to 185°F (-40°C to 85°C)	Operating: 10% to 90% non-condensing Non-Operating: 5% to 95% non-condensing	10″ W x 13″ D x 3″ T (254mm W x 330mm D x 76mm T)

Standard Camera

Overview

Optical Detection Camera with Standard Enclosure

In|Sync video detection uses high-performance Samsung IP digital cameras to measure traffic occupancy, queue length and delay in **real-time**. Each camera is delivered to you, ready for installation in a weatherproof enclosure, and connects to both power and Ethernet network in just seconds. You have direct access to camera views and settings via the **In|Sync WebUI**.

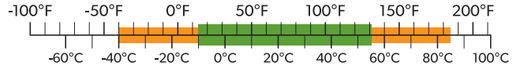
Features

Camera - Samsung SNZ-6320

- 4.44 – 142.6 mm (32x) optical zoom, 16x digital zoom

Enclosure - Bosch UHO-HBGS-11

- Hinged side opening for easy installation and camera setup
- Window defroster with self-cleaning glass
- IP66, NEMA-4X rating



	Power	Weight	Temperature	Humidity	Dimensions
Camera	12 VDC, max 9W	1.19 lb (540g)	**Operating:** 14°F to 131°F (-10°C to 55°C)	20% to 80% non-condensing	2.83″ x 2.36″ x 5.33″ (72.0 x 59.9 x 135.4 mm)
Enclosure	24 VDC, max 45W	6.8 lb (3.2 kg)	**Non-Operating:** -40°F to 185°F (-40°C to 85°C)		5″ x 6.7″ x 18.9″ (126.5 x 171.3 x 480 mm) including sunshield

EXHIBIT A

All Weather Camera

In|Sync:FIRE

Overview

Optical Detection Camera with Ring-of-Fire De-icing/Defrosting Enclosure

In|Sync:FIRE is a rugged, heavy-duty, heated camera housing that provides additional protection to **In|Sync**'s video detection cameras in the harshest winter environments. The enclosure melts snow and ice, eliminating obstructions that can block the camera's view.

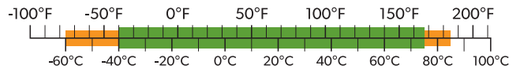
Features

Camera - Samsung SNZ-6320

- 4.44 – 142.6 mm (32x) optical zoom, 16x digital zoom

Enclosure - Dotworkz ST-RF-MVP

- Ring-of-Fire de-icing/defrosting system removes the snow and ice that would normally obstruct a cameras view
- Housing seals keep out all moisture and dust
- Enables IP cameras to operate in freezing locations, with temperatures down to -60°C
- Thermostatically controlled de-icing and heating unit keeps the internal electronics at ideal operating temperature
- Case is designed to be "vandal tough" to protect valuable electronics from damage and theft
- Heavy-duty, non-metallic, non-corrosive, flame-resistant, Polycarbonate Thermal Plastic alloy case
- Exceeds IP66 rating



Enclosure Camera

Power	Weight	Temperature	Humidity	Dimensions
12 VDC, max 9W	1.19 lb (540g)	**Operating:** -40°F to 165°F (-40°C to 74°C)	20% to 80% non-condensing	2.83" x 2.36" x 5.33" (72.0 x 59.9 x 135.4mm)
24 VDC, max 50W	11 lb (5 kg)	**Non-Operating:** -76°F to 185°F (-60°C to 85°C)		5" x 6.7" x 18.9" (126.5 x 171.3 x 480 mm) including sunshield

Thermal Detection Camera

In|Sync:THERMAL

Overview

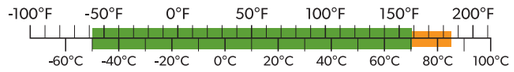
FLIR ITS-Series Thermal Detection Camera

In|Sync:THERMAL brings mission-critical military-grade technology to adaptive traffic signal solutions. Even in poor visibility conditions - including low light, fog, glare, rain, shadows and low vehicle-to-pavement contrast - **In|Sync:THERMAL** provides accurate and reliable imaging to help improve traffic flow. By using heat signatures, the system can detect vehicles that might escape traditional video detection.

Features

Camera - FLIR ITS-Series

- Maintenance free uncooled microbolometer detector that produces high quality thermal images on which the smallest of details can be seen
- 4 camera options for different focal lengths and fields of view for each approach at each intersection (FC-344-ID, FC-332-ID, FC-324-ID, and FC-317-ID)
- Support for extremely harsh temperature environments, operating between -50°C and +70°C
- IP66 & IP67 rated
- Allows for images to be viewed in all conditions, day or night, in practically any weather
- Thermal sensor is not hindered by reflections of sun glare, shadows, headlights, or wet pavement



Power	Weight	Temperature	Humidity	Dimensions
24 VDC/ 24 VAC(VA) max 32W	4.8 lb (2.2 kg)	**Operating:** -58°F to 158°F (-50°C to 70°C) **Non-Operating:** -58°F to 185°F (-50°C to 85°C)	0% to 95%	10.8" x 5.4" x 4.4" (275 x 137 x 102 mm)

Connection Options

EXHIBIT A

Overview

To best integrate with your traffic controller, cabinet, and other existing equipment, we provide five different connection options to the **In|Sync Processor**.

C1 Y-Cable

The C1 Y-Cable is the custom connection between a 170 or 2070 traffic controller (33X Cabinet) and the **In|Sync Processor**. It supports **In|Sync** and **In|Sync:FUSION**.

ABC Y-Cable

The ABC Y-Cable is the custom connection between a NEMA TS1 or TS2-Type 2 traffic controller and the **In|Sync Processor**. It supports **In|Sync** and **In|Sync:FUSION**.

SDLC Intercept Module

The SDLC Intercept Module is the custom connection between a NEMA TS2-Type 1 or NEMA TS2-Type 2 traffic controller and the **In|Sync Processor**. It supports **In|Sync** and **In|Sync:FUSION**.

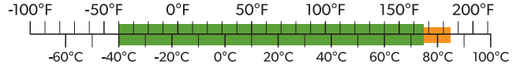
C1-Y Cable

Overview

The C1 Y-Cable provides connection between a 170 or 2070 traffic controller and the **In|Sync Processor**. Using the C1 Y-Cable makes for fast, easy, error-free installation and allows you to integrate your existing detectors with the **In|Sync** system.

Features

- Heavy-duty die-cast DB25 connector shells
- Compatible with 170/2070 traffic controllers
- Uses standard 104-pin connection to C1 cable
- Uses minimal space in cabinet
- Available in mode-specific configuration



Power	Weight	Temperature	Humidity	Dimensions
N/A	3 lb (1.3 kg)	**Operating:** -40°F to 165°F (-40°C to 74°C) **Non-operating:** -40°F to 185°F (-40°C to 85°C)	N/A	6 ft long

EXHIBIT A

ABC-Y Cable

Overview

The ABC Y-Cable provides connection between a NEMA TS1 or TS2-Type 2 traffic controller and the **In|Sync Processor**. Using the ABC Y-Cable makes for fast, easy, error-free installation and allows you to integrate your existing detectors with the **In|Sync** system.

Features

- Standard A, B and C locking NEMA connectors
- Heavy-duty die-cast DB25 connector shells
- Compatible with NEMA TS1 or TS2-Type 2 traffic controllers
- Uses minimal space in cabinet
- Available in mode-specific configuration

-100°F -50°F 0°F 50°F 100°F 150°F 200°F
-60°C -40°C -20°C 0°C 20°C 40°C 60°C 80°C 100°C

Power	Weight	Temperature	Humidity	Dimensions
N/A	3 lb (1.3 kg)	**Operating:** -40°F to 165°F (-40°C to 74°C) **Non-operating:** -40°F to 185°F (-40°C to 85°C)	N/A	6 ft long

SDLC Intercept Module

Overview

The SDLC Intercept provides connection between a NEMA TS1 or TS2-Type 2 traffic controller and the **In|Sync Processor**. Using the SDLC Intercept Module makes for fast, easy, error-free installation and allows you to integrate your existing detectors with the **In|Sync** system.

Features

- Compact, stand-alone box design easily sits on a shelf
- Supports standard NEMA TS2 SDLC and ITS connections
- Provides a switch for manually bypassing the intercept mode
- Contains an Ethernet port for 10/100 network connectivity
- Contains an RS-232 port and associated RJ12 connector for local serial access
- Compatible with the NEMA TS2-Type 1 and TS2-Type 2 traffic controllers
- Uses minimal space in cabinet
- Includes BIU cable
- Includes serial cable for SDLC Intercept module to In|Sync Processor communication
- Includes power cable for SDLC Intercept module

-100°F -50°F 0°F 50°F 100°F 150°F 200°F
-60°C -40°C -20°C 0°C 20°C 40°C 60°C 80°C 100°C

Power	Weight	Temperature	Humidity	Dimensions
12 to 48VDC	1.4 lb (0.68 kg)	**Operating:** -40°F to 165°F (-40°C to 74°C) **Non-Operating:** -40°F to 185°F (-40°C to 85°C)	Operating: 10% to 90% non-condensing Non-Operating: 5% to 95% non-condensing	1.75" W x 5.75" D x 8" T (44mm W x 146mm D x 203mm T)

EXHIBIT A

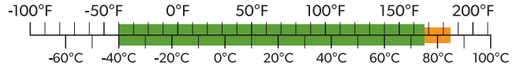
Intercept Module

Overview

The Intercept Module allows **In|Sync** to accept non-standard detection inputs such as those from pedestrian push buttons, railroad crossings, transit system priority and emergency vehicle preemption.

Features

- Provides for eight field inputs and eight field outputs
- Provides a way to listen to and produce signals that are 12 VAC or 24 VDC referenced
- Compact, stand-alone box design easily sits on a shelf
- Optional bracket allows rack mounting
- Contains an RJ12 connector to connect to the **In|Sync Processor**
- Built-in fail-safes allow inputs to be passed through during communication or power failures
- Includes a serial cable



Power	Weight	Temperature	Humidity	Dimensions
20-30 VDC, max current: 250 mA Reverse Polarity Protection ESD Protection	1.4 lb (0.68 kg)	**Operating:** -40°F to 165°F (-40°C to 74°C) **Non-Operating:** -40°F to 185°F (-40°C to 85°C)	Operating: 10% to 90% non-condensing Non-Operating: 5% to 95% non-condensing	1.75" W x 5.75"D x 8" T (44mm W x 146mm D x 203mm T)

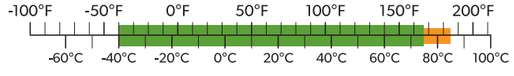
DIN Relay

Overview

The DIN Relay cycles power to the cameras, ensuring that a camera recovers if the network port loses its connection to the camera. This eliminates the need to be on-site to reset equipment that has "locked up."

Features

- Pluggable contacts for easier installation
- Relay fuses to protect against over-current
- Self resetting crowbar over-voltage protection
- HTTPS, SSL, SSH with tighter security
- Internal event notifications
- Wired ethernet
- Snaps directly to DIN rail or bolts to panel
- LCD Display
- Relay switching power: 10 A at 125 VAC, Fused at 12 A
- Software controls



Power	Weight	Temperature	Humidity	Dimensions
12-48 VDC max 5.8 W	2.7 lb (1.2 kg)	**Operating:** -40°F to 165°F (-40°C to 74°C) **Non-Operating:** -40°F to 185°F (-40°C to 85°C)	N/A	6.00" W x 4.25" D x 2.25" T (153mm W x 108mm D x 57mm T)

EXHIBIT A

Monitor & Keyboard Set

Overview

The Monitor & Keyboard Set allows full monitoring and configuration of the system at the cabinet. The monitor has a resolution of up to 1024 x 600 (H x V) formatted.
The standard USB keyboard comes with an integrated trackball for mouse emulation.

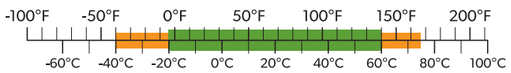
Features

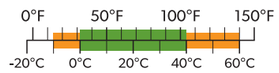
Monitor :
Lilliput FA1012-NP/C/T

- *Screen size:* 10.1”
- LED (16:9)
- Resistive touch panel
- *Resolution:* 1024x600
- *Brightness:* 250 cd/m2
- 53.5x162.5x35/65.5mm (with bracket)

Keyboard :
Periboard-505 H Plus

- 12.4x5.8x1 inches mini size (315 x 147 x 20 mm)
- Built-in 0.55 inches optical trackball for easy control of mouse function
- Built-in 2 USB hubs
- 5.90 ft durable cable (1.8 m)





	Power	Weight	Temperature	Humidity	Dimensions
Monitor	12 VDC max 9W	2.6 lb (1.18 kg)	**Operating:** -4°F to 140°F (-20°C to 60°C) **Non-Operating:** -40°F to 165°F (-40°C to 74°C)	up to 90% non-condensing	10” W x 6.4” T x 1.4”D (2.6” D with bracket) (253.5mm W x 162.5mm T x 35/66mm D)
Keyboard	N/A	15.5 oz (0.44 kg)	**Operating:** 32°F to 104°F (0°C to 40 °C) **Non-Operating:** 14°F to 140°F (-10°C to 60°C)	10% to 85% non-condensing	5.8” W x 12.4” D x 0.8” T (147mm W x 315mm D x 20mm T)

Pedestrian Integration

Overview

In|Sync Pedestrian Integration is required at any intersection that has or will have pedestrian signal indication.

The **In|Sync Pedestrian Integration** provides the benefit of incorporating pedestrian service into the operation of the intersection, regardless of cabinet architecture. Any necessary hardware (e.g., an intercept module) will be provided for no additional cost.
With the **In|Sync Pedestrian Integration**, pedestrian calls are intercepted by the **In|Sync Processor**.

In|Sync then schedules pedestrian service and serves the pedestrian phase along with the respective vehicle phase, providing uninterrupted service to platoons of traffic and leveraging all the benefits of **In|Sync**’s local and global optimization.

Features

- Integrates with all existing pedestrian hardware
- Can be configured to provide pedestrian service multiple times and every time between tunnels
- Provides efficient pedestrian service with minimal impact on coordination

Software

In|Traffic

Overview

In|Traffic is a comprehensive, all-in-one software solution that integrates a wide array of traffic management tools into a simple yet powerful, intuitive and user-friendly console.

In|Traffic incorporates operational, monitoring and analytical components into one powerful web-based software. It allows traffic professionals to manage and configure all of their Rhythm Engineering solutions from one **Central Command Console (C³)** to mitigate traffic congestion.

- Configure any solution with ease
- Advanced, easy-to-use interface
- Advanced monitoring and data visualization
- Free with any Rhythm Engineering product purchase

EXHIBIT A

In|Traffic Facts

Centralized Tool for All Operations and Analysis

Traffic professionals can manage and configure all Rhythm Engineering traffic signal systems from one centralized command console solution, using a single user interface. **In|Traffic** provides all the functionality necessary for performing a traffic engineer's job.

Consolidates Device Configuration, Operations and Performance Metrics

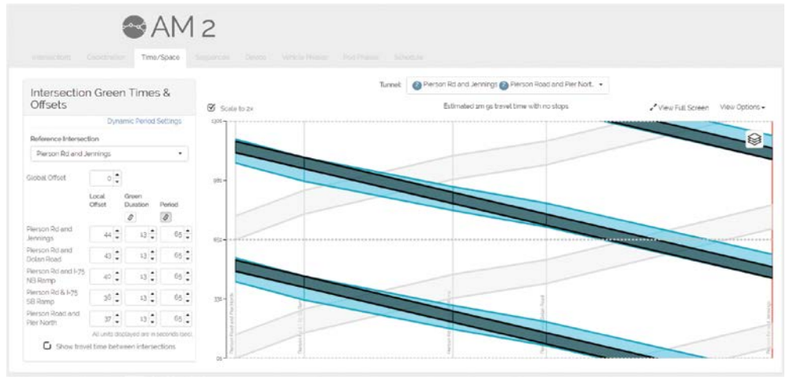
In|Traffic integrates and simplifies the configuration of all equipment used at an intersection, and its built-in validation ensures configurations will work before they are sent to the field. **In|Traffic** also collects data from field devices for performance metrics, which are integral to determining how well a transportation system is running and where improvements can be made.

Collects and Synthesizes Traffic Management Data

In|Traffic continuously aggregates data from processors in the field and presents the data in meaningful graphs and tables for easy analysis. This field-level system information allows traffic engineers to easily identify trends, spot areas that require attention and take action on improvement measures.

Browser-Based Interface

Users can access **In|Traffic** from any device (Mac, PC, tablet or smartphone), in the field or in the office, using any standard web browser, allowing configuration changes to be made remotely. Any configuration changes made in the browser are fully synchronized with the central repository, preventing conflicts and double-data entry.



Encourages Creative Problem Solving

In|Traffic's Time/Space Diagram allows engineers to run *"what-if"* scenarios to see the impact of configuration changes. Tweaking the offsets, durations and periods can be done directly in the diagram. Users can also use the program's Sandbox mode to set up and configure management groups and experiment with different settings without making permanent changes to the database.

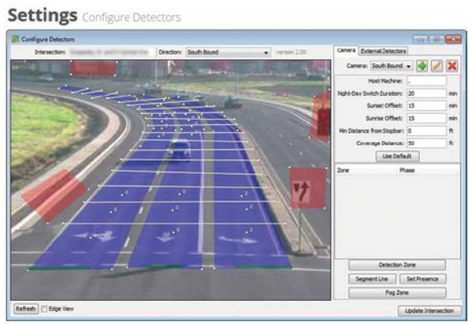
WebUI

EXHIBIT A

Overview

The **In|Sync Web User Interface (WebUI)** gives you live, interactive access to the traffic conditions on your **In|Sync** corridor. Watch camera views of every approach and access individual **In|Sync Processors** and traffic data using any internet browser — no special software required!

The **WebUI** provides a live feed from **In|Sync** cameras to any web browser. The multi-camera view, shown here, displays real-time video from all the approaches at a single intersection



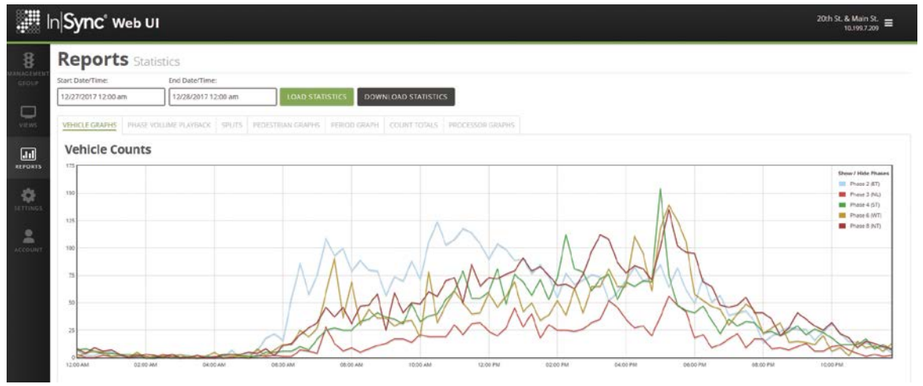
The **In|Sync** video detection settings can be easily and remotely adjusted through the Configure Detectors utility, which is accessible through the **WebUI**'s Settings menu

WebUI can be used to check the status of adaptive operations, monitor detector calls intercepted by **In|Sync**, monitor communications status and, if necessary, place manual calls or turn off adaptive traffic control. Traffic counts, delay and level of service data are stored automatically for 30 days and can be displayed in the **WebUI**. **WebUI** can archive historical data for future analysis.

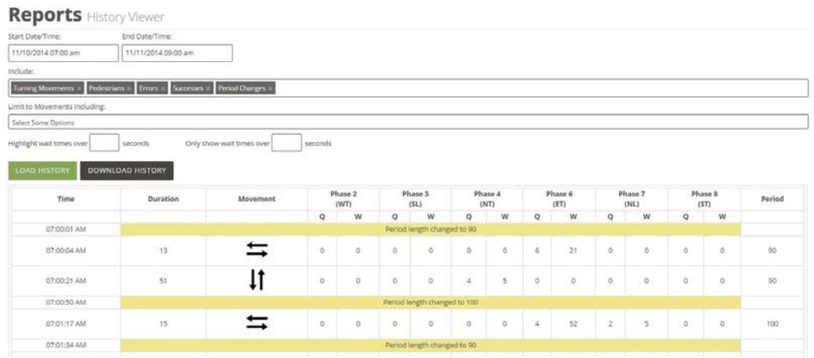
Monitor all the cameras along a corridor, in one screen, using the Corridor View

System Requirements

- *Device:* Any Internet-connected device (computer, tablet or smartphone) meeting the browser and display specifications below
- *Web Browser:* Internet Explorer 7 or later, Firefox 4 or later, or Chrome 9 or later
- *Display:* 1024x768 screen required to minimize scrolling; 1920x1280 recommended
- *Internet Speed:* 512Kbps or faster required; 1Mbps or faster recommended



The **WebUI** offers data-rich reporting on vehicle count, stop delay, and more. Additionally, it converts the traffic statistics into easy-to-read graphs and charts, such as this chart showing vehicle counts per phase over time.



The **WebUI**'s History Viewer shows green times allocated phasing and intersection information such as vehicle count, wait times, movements served, adaptive functionality and pedestrian calls. This allows you to determine the signal's inputs and operations, historically at any given time.

Communications

EXHIBIT A

Communication Requirements

In|Sync requires reliable Ethernet communications between the intersections (interconnect). This enables real-time signal optimization and synchronization.

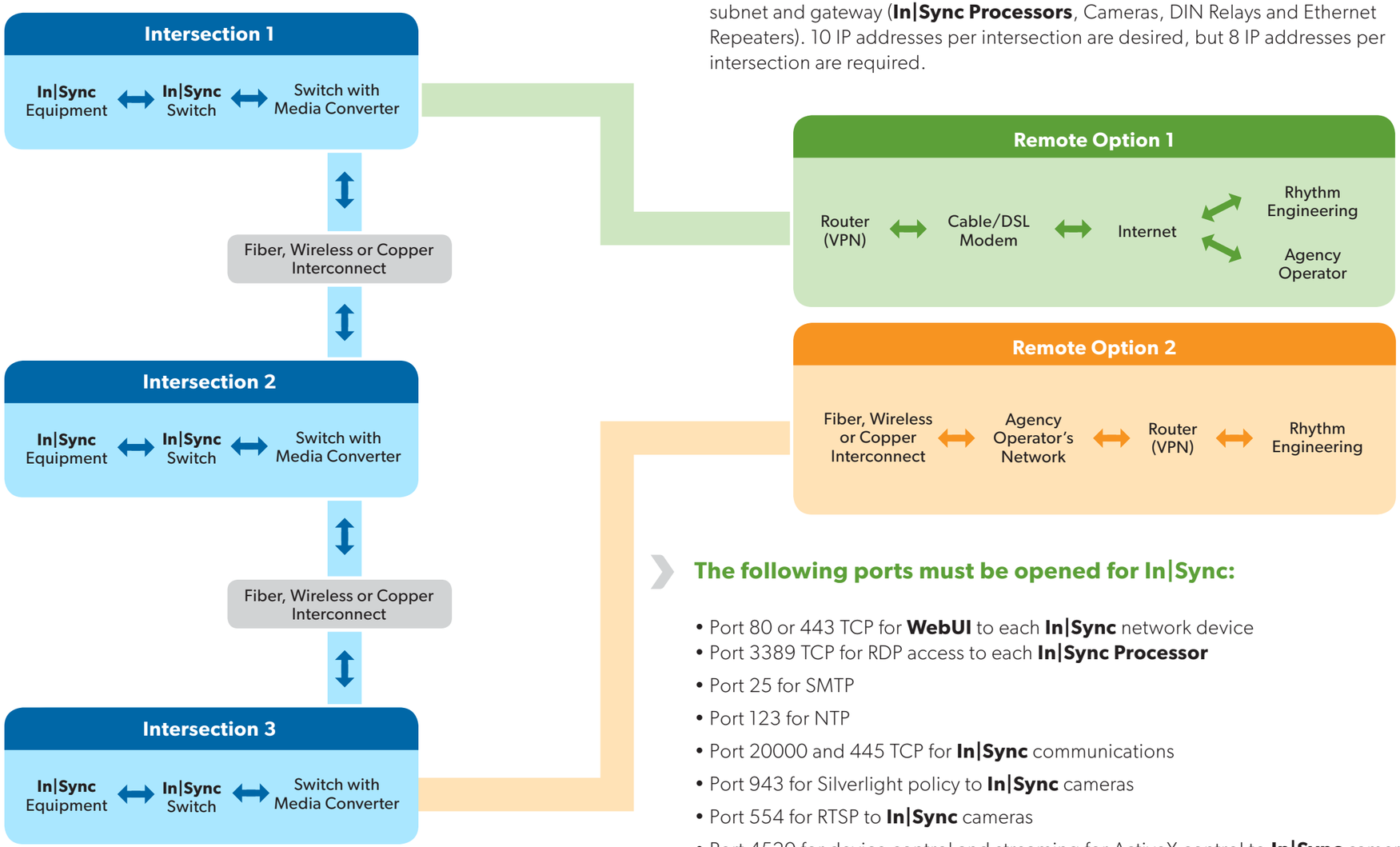
Establishing and maintaining communications is the agency's responsibility and must be installed and verified prior to Rhythm Engineering's on-site installation training.

Fiber-optic cable, Ethernet-over-copper, cell phone modems and wireless radios all work well with **In|Sync**. In fact, **In|Sync** can use and integrate different cabling types on the same corridor.

Ethernet repeaters are required when Ethernet cable runs from the cameras are greater than 320 ft (100 m).

Remote Access for Monitoring and Updating

Your **In|Sync** corridor, including all equipment such as **In|Sync Processors** and cameras, must be remotely accessible both to you and Rhythm Engineering for monitoring and updating purposes.
There are two ways to achieve this – either by connection via cable or DSL to the Internet at one point along the corridor (Option 1) or by connecting directly via your existing network (Option 2).



Your agency must provide:

- A fully configured and installed router with VPN and firewall capabilities
- A bandwidth of 2 megabits per second (Mbps) download speed and 1 Mbps upload speed
- VPN access for at least four unique user accounts to Rhythm Engineering staff
- Static IP address assignments for each **In|Sync** network device with designated subnet and gateway (**In|Sync Processors**, Cameras, DIN Relays and Ethernet Repeaters). 10 IP addresses per intersection are desired, but 8 IP addresses per intersection are required.

The following ports must be opened for In|Sync:

- Port 80 or 443 TCP for **WebUI** to each **In|Sync** network device
- Port 3389 TCP for RDP access to each **In|Sync Processor**
- Port 25 for SMTP
- Port 123 for NTP
- Port 20000 and 445 TCP for **In|Sync** communications
- Port 943 for Silverlight policy to **In|Sync** cameras
- Port 554 for RTSP to **In|Sync** cameras
- Port 4520 for device control and streaming for ActiveX control to **In|Sync** cameras

Deployment Timeline

EXHIBIT A

Agency

Order In|Sync

Order **In|Sync** with a purchase order or contract

Prepare Corridor

Begin integration readiness checklist: provide corridor data and IP addresses, install communications and power/Ethernet cabling

Establish Communications

Verify corridor communications are operational, VPN access provided and readiness checklist completed

Complete Installation

Complete **In|Sync** installation. **In|Sync** is in detector mode for remote verification

Prepare Controllers

Put traffic controllers in free mode to allow **In|Sync** to place calls

Rhythm Engineering

Capture Goals

Host project goal meeting to capture your agency's objectives

Begin Project

Host project kick-off meeting to establish deployment timeline and clarify responsibilities

Order Parts

Procure and test hardware components

Verify Communications

Verify corridor communications and remote VPN access 2-3 weeks prior to on-site training

Configure Hardware

Engineers configure **In|Sync** hardware with agency specific IP addresses

Ship Equipment

Ship **In|Sync** equipment

Installation Training

Technician on-site for three days of classroom and field training on installation, operation and maintenance

Configure Corridor

Adaptive Turn-On

Engineer on-site to perform adaptive turn-on, drive corridor with your agency and make adjustments as needed — your traffic signals are now fully adaptive

Monitor Corridor

Monitor corridors for 2-3 weeks and collaborate with your agency on final adjustments

Project Complete

Host project close meeting to confirm objectives were achieved

EXHIBIT A

Pricing

Per Intersection

HARDWARE & SOFTWARE

$25,000 — **In|Sync**

In|Sync uses Rhythm Engineering's video detection (up to four cameras included). Every **In|Sync** system includes an **In|Sync Processor**, an Equipment Panel, the appropriate connection to the cabinet, In|Traffic, the **In|Sync WebUI**, a two-year hardware and software warranty, and 24/7/365 technical support

$30,000 — **In|Sync:FIRE**

In|Sync:FIRE enclosure melts snow and ice, eliminating obstructions that can block the camera's view. It provides functionality even in the harshest winter environments

$40,000 — **In|Sync:THERMAL**

In|Sync:THERMAL can detect vehicles that might escape traditional video detection in poor visibility conditions

$5,000 — **In|Sync:FUSION** (add-on option)

In|Sync:FUSION integrates your existing detectors with our video detection (up to 4 cameras included) for superior detection accuracy

$5,000 — **Pedestrian Integration** (add-on option)

Pedestrian Integration needed for all intersections with pedestrian signal, optimizes pedestrian traffic or other special inputs along with vehicular traffic

OPTIONAL EQUIPMENT

$700 — **Keyboard & monitor kit**

Enables you to monitor and interact with **In|Sync** when you are in the field

Rhythm Engineering strongly recommends purchasing local hardware spares at a 10% level (1 spare for 1-10 systems, 2 spares for 11-20 systems, etc.). One spare would include: 1 **In|Sync Processor**, 1 Equipment Panel, and 3 **In|Sync** Cameras

$12,500 — **In|Sync Spare kit**

$14,000 — **In|Sync:FIRE Spare kit**

$18,500 — **In|Sync:THERMAL Spare kit**

DEPLOYMENT SERVICES

The deployment services fee covers consulting time for training, on-site installation assistance, remote configuration and ongoing support of your **In|Sync** deployment

$3,500 — **1 - 4 intersections**

$5,000 — **5 - 9 intersections**

$10,000 — **10 - 20 intersections**

SHIPPING & HANDLING

$150 — **Shipping** *(per intersection)*

Standard ground service

Other required items include:
Camera mounting hardware, Cat5E, 14-3 Power cable, Ethernet repeaters and injectors.
These may be purchased from Rhythm or from another vendor.

Sample Pricing

Sample investment for a 12-intersection corridor with In|Sync

Item	Quantity	Unit Price	Total Price
In|Sync	12	$25,000	**$300,000**
In|Sync:FUSION *(add-on option)*	12	$5,000	**$60,000**
Pedestrian integration *(add-on option)*	8	$5,000	**$40,000**
Deployment services	1	$10,000	**$10,000**
Hardware warranty	48	$500	**$24,000**
Software updates	48	$250	**$12,000**
Technical support	48	$250	**$12,000**
Shipping & handling	12	$150	**$1,800**
Keyboard & monitor kit	2	$700	**$1,400**
In|Sync Spare kit	2	$12,500	**$25,000**
TOTAL INVESTMENT			**$486,200**

Sample investment for a 4-intersection corridor with In|Sync:THERMAL

Item	Quantity	Unit Price	Total Price
In|Sync:THERMAL	4	$40,000	**$160,000**
In|Sync:FUSION *(add-on option)*	1	$5,000	**$5,000**
Pedestrian integration *(add-on option)*	4	$5,000	**$20,000**
Deployment services	1	$3,500	**$3,500**
Hardware warranty	16	$500	**$8,000**
Software updates	16	$250	**$4,000**
Technical support	16	$250	**$4,000**
Shipping & handling	4	$150	**$600**
Keyboard & monitor kit	1	$700	**$700**
In|Sync:THERMAL Spare kit	1	$18,500	**$18,500**
TOTAL INVESTMENT			**$224,300**

One year of warranty, software updates, and technical support is provided with system purchase. These examples show 4 additional years purchased, respectively 4x12=48 and 4x4=16 quantity.

Warranty

In|Sync Extended Warranty and Technical Support Options

In|Sync is shipped with an included, free 1-year hardware and software Warranty and 24/7/365 remote technical support.
The following extended warranty and technical support options are available.

	Per Intersection/Year
Full Hardware Warranty Available for up to 4 additional years after the included 1-year warranty[1]	$500
Software updates[2]	$250

TECHNICAL SUPPORT OPTIONS

BRONZE: Up to 4 hours of remote 24/7/365 technical support	$250
GOLD: Unlimited remote 24/7/365 technical support	$500
PLATINUM: Unlimited remote 24/7/365 technical support and remote monitoring[3]	$950

ADDITIONAL ONE-OFF SERVICES

Onsite engineering evaluation, training and configuration optimization[4]	$1,000

Professional service fees will be charged at the following rate for out-of-warranty work:
- Engineering remote support - **$125/hour**
- Technician remote support - **$90/hour**

If travel is required, client will be required to reimburse actual travel expenses.

Hardware components can be purchased from the published Rhythm Engineering component price list. Hardware under any kind of warranty plan listed above can be purchased at a discount of **7.5% off** the list price[5]

[1] - **In|Sync** is shipped with a 1-year free, included hardware and software warranty that begins on the date of installation or 6 months after the shipping date, whichever comes first.

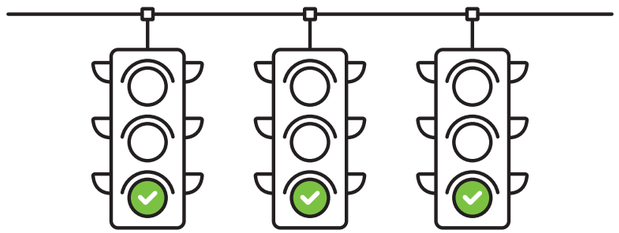
[2] - Software updates as released; normally 1 or 2 per year.

[3] - Remote Monitoring option provides weekly reports on **In|Sync**'s performance and proactive monitoring to alert you to potential issues before they become problems.

[4] - Cost may slightly vary based on the scope and the complexity of the project. This amount, inclusive of travel and accommodation expenses of Rhythm staff, should hold true for most projects.

[5] - Hardware is only eligible for warranty protection for five years (after installation or 6 months after the day of shipping). After five years, clients may return any malfunctioning equipment to be repaired on a time-and-materials basis, or may purchase new hardware components at list price. Replacements of hardware components for an intersection with an active software or support warranty shall be discounted 7.5% off list price.

EXHIBIT A



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Receive a FREE Arterial Audit

In 3 simple steps:

Step 1 **Please, contact our team at 913.227.0603**

Step 2 **We will conduct detailed in-field audit of your Arterial**

Step 3 **You will receive a performance-metrics report of your Arterial with recommendations**

913.227.0603

info@rhythmtraffic.com

EXHIBIT A

InSync®

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