City of Isle of Palms, South Carolina
Request for Bids 2026-10
IOP Connector Adaptive Traffic Signal Installation

In compliance with the City's Procurement Code, the City of Isle of Palms (the City) is requesting sealed bids from qualified, licensed, SCDOT-approved traffic signal contractors to install equipment furnished by Rhythm Engineering to convert the traffic signal at the base of the Isle of Palms Connector to adaptive operation. The contractor shall furnish the labor, installation materials, equipment, traffic control, permits assigned to the contractor, testing, and field support needed to complete the work.

Description of the project

The project includes two work locations. Site A is the signalized intersection of Palm Boulevard and 14th Avenue at the Isle of Palms Connector, with an existing Model 332 cabinet and 2070 controller. Site B is a separate queue-detection installation on an existing wooden utility pole east of the intersection. Queue information from Site B will be transmitted to Site A over a cellular connection. Both sites are included in this RFB.

The technical scope is based on the Rhythm Engineering Contractor Installation Instructions, Revision 2, dated September 29, 2026, and the applicable portions of the accompanying manufacturer guides, provided separately as Attachment A. The project-specific Revision 2 instructions govern over conflicting generic manual instructions. Report conflicts among the bid documents, drawings, permit requirements, or manufacturer instructions to the City for written clarification before proceeding.

Equipment and responsibilities

Rhythm Engineering: Furnishes the four In|Sync cameras, In|Sync processor, site equipment panel, C1 Y-cable, camera mounting hardware, Eagle|Eye camera and processor, Site B NEMA enclosure and internal power/network components, and two preconfigured cellular modems. Rhythm provides IP addressing, modem configuration, and remote technical support. The contractor installs all of these items, including the equipment inside the traffic cabinet.

City: Makes the existing electrical supply at Site A available, obtains Dominion Energy's permission to attach equipment to the Site B pole, and obtains SCDOT's required permissions for the project. The City provides available traffic counts, phasing, signal timing, and pedestrian timing information and will coordinate Rhythm's services and active cellular service for commissioning. Recurring cellular charges, software licensing, and ongoing traffic optimization are outside this installation bid.

Contractor: Provides the 120 VAC power source at Site B and furnishes all power and communications cabling, connectors, conduit, grounding and bonding materials, surge protection, pole bands or clamps, incidental hardware, access equipment, and other installation items not identified as Rhythm-furnished. Include any required Ethernet repeaters and associated PoE injectors; these are not part of Rhythm's furnished-equipment package.

Scope of work

1 Site verification and coordination

Review both sites and coordinate a kickoff meeting with the City and Rhythm. The City will issue the site-specific drawings and camera locations to all bidders by addendum before the written-question deadline, allowing time for review and clarification. The drawings shall identify cable routes, the Site B pole, the approved electrical source and connection point, and the service equipment and electrical work required to establish power at Site B. Submit questions about omissions or conflicts by the questions deadline. Cabinet access must be arranged through the City; bidders shall not disturb existing signal equipment.

Before installation, verify mounting locations, cable lengths, conduit access, and equipment fit against the issued design. Inventory furnished equipment and report shortages or damage within five business days of delivery and before installation. Photograph and promptly report shipping damage. Schedule work requiring Rhythm support during its office hours, Central Time.

2 Site A signal installation

Install the four detection cameras and mounting hardware at the approved signal locations. Install all In|Sync cabinet components, including the equipment panel, processor, grounding, C1 Y-cable connection to the existing 2070 controller, and cellular modem. Provide the specified power and Ethernet runs to the cameras. Follow Rhythm's project-specific connection instructions; detector cards and RG cables are not required for this installation. Protect existing signal equipment and retain normal signal capability during integration.

3 Site B queue detection installation

The contractor shall provide the 120 VAC electrical power source at Site B, including all required service equipment, connections, wiring, conduit, electrical permits, inspections, utility coordination, and one-time utility connection charges. Coordinate the source and connection with Dominion Energy and the City. Do not mount equipment until the City confirms Dominion's pole-attachment permission and required SCDOT permissions. Include this work in the Site B bid price. Recurring electricity charges are outside this installation contract. This assignment supersedes only the provision in Section 7 of Rhythm's Revision 2 Contractor Installation Instructions assigning Site B power to the City; all other applicable manufacturer requirements remain in effect.

After the City confirms pole-owner attachment approval, mount the Eagle|Eye camera approximately 25 to 30 feet above ground at the approved location. Mount and equip the NEMA enclosure with the supplied processor, power supplies, PoE injector, network switch, and modem. Connect the enclosure to the contractor-provided 120 VAC source and provide the specified camera cabling, grounding, bonding, and weather protection. Site B is a stand-alone queue-detection installation; no signal-controller connection is required there.

4 Cabling and materials

Provide Category 6A F/UTP shielded, outdoor, direct-burial, water-blocking Ethernet cable with 23 AWG solid copper conductors and compatible shielded connectors, meeting Section 3 of the project-specific Revision 2 Contractor Installation Instructions. Terminate both ends to T-568B and bond the drain wire to the connector shield. Use 14 AWG, three-conductor, shielded, direct-burial power cable for the equipment runs specified in those instructions.

Size any service or feeder conductors for the approved design and applicable electrical code. These project-specific cable requirements supersede the generic manuals.

Provide the specified cable slack, including 10 feet at the cabinet, 5 feet at each camera, and the additional 10 feet of spare Ethernet cable and power conductor at the east-facing mast-arm camera. Secure and protect all slack. Verify runs exceeding 100 meters (328 feet) with Rhythm and include the required repeaters and PoE injectors. Obtain Rhythm's written approval of substitutions before purchase.

5 Permits and traffic control

The City will obtain Dominion Energy's pole-attachment permission and the SCDOT permissions required for the project, including any required encroachment approval. The contractor shall provide installation information needed to support those approvals and comply with their conditions. Obtain and pay for required electrical permits, other contractor installation permits not provided by the City, and inspections, including those for the Site B power supply. These allocations govern over any general assignment of permits to the contractor in Attachment A. Perform electrical work, grounding, bonding, and surge protection in accordance with the applicable electrical code and SCDOT requirements.

Provide traffic control, flaggers, lane closures, and pedestrian protection required for safe installation. Coordinate any signal interruption, flashing operation, or temporary timing changes with the City and SCDOT before work. Preserve required clearance and pedestrian intervals, protect existing utilities and equipment, and restore disturbed areas. Do not begin affected work until required approvals are in place.

6 Testing and commissioning

Test every terminated Ethernet run under Section 5 of the project-specific Revision 2 Contractor Installation Instructions, using a Fluke CableIQ CIQ-100 or equivalent or better tester meeting Rhythm's requirements. Label reports by camera and approach, submit them to Rhythm and the City, and correct and retest failed runs. Do not connect an Ethernet cable to a camera before the run has passed testing. Obtain Rhythm's written authorization before energizing any Rhythm equipment and before placing In|Sync in detector or adaptive mode.

Under Rhythm's remote direction, complete camera aiming, zoom, and focus; verify communications at both sites; and assist with controller integration and authorized adaptive startup. Include field labor and return visits necessary to complete initial integration, camera adjustments, and correction of installation deficiencies. Rhythm's remote support does not replace the contractor's field responsibilities.

7 Completion and acceptance

Request City acceptance after installation and required inspections are complete, all cable tests pass, Rhythm confirms acceptable camera views and communications at both sites, and authorized system operation has been demonstrated. Correct contractor-caused deficiencies without additional cost. Provide labeled test reports, equipment inventory, installation photographs, record cable routes and lengths, applicable warranties, and required inspection records. Remove debris and leave both sites clean and secure. Acceptance concerns proper installation and integration; no separate traffic-delay reduction guarantee is required of the installer.

Bid format

Submit the signed bid form included in this RFB and the following information:

- Evidence of applicable South Carolina licensing and SCDOT approval to perform traffic signal work; identify the field supervisor and relevant experience.
- Three examples of similar signal installation projects, with a brief description and reference contact information. Identify any experience installing Rhythm systems.
- A proposed schedule, including calendar days after notice to proceed, anticipated mobilizations, and coordination needed for commissioning.
- Names of proposed subcontractors and their assigned work, plus any requested exceptions to the RFB. Exceptions may cause a bid to be deemed nonresponsive.

Provide a fixed total price for both sites, with the breakdown on the bid form. Include all labor, contractor-furnished materials, the Site B electrical power supply and one-time utility connection charges, required repeaters, mobilizations, permits assigned to the contractor, traffic control, testing, commissioning support, taxes, insurance, applicable bond costs, and overhead. Exclude the purchase cost of Rhythm-furnished equipment. Base the price on the drawings and addenda issued to all bidders. Keep bids open for acceptance for 90 days after the bid deadline.

Evaluation and award

The City will evaluate bids under its Procurement Code and intends to award the complete project to the lowest responsible bidder submitting a responsive bid. Responsibility will include licensing, SCDOT approval, relevant experience, references, available personnel and equipment, and ability to perform within the proposed schedule. The City may request supporting information and investigate qualifications. City staff will recommend an award to City Council, subject to required approvals and available funding.

The City may reject any or all bids, waive minor informalities as permitted by its Procurement Code, or cancel the solicitation. Bidders bear their own preparation and submission costs. Issuance of this RFB or review of a bid does not commit the City to award a contract.

Timeline and submission procedures

RFB advertisement: November 2, 2026

Deadline for written questions: December 10, 2026

Deadline for bids and public opening: December 18, 2026, 10:30 a.m.

Submit one signed paper copy and one PDF copy on a USB flash drive in a sealed envelope marked "RFB 2026-10, IOP Connector Adaptive Traffic Signal Installation." Address the submission to Douglas Kerr, City Administrator, City of Isle of Palms. Deliver by hand or courier to 1207 Palm Boulevard, Isle of Palms, SC 29451. For U.S. mail, use Post Office Box 508, Isle of Palms, SC 29451.

Bids must be received by the stated deadline and will be publicly opened at City Hall, 1207 Palm Boulevard. It is the bidder's responsibility to verify timely receipt; the City is not responsible for delivery delays or errors. Late bids will not be considered. Include the bidder's current email address and telephone number.

Submit questions and requests for site access to Douglas Kerr at dkerr@isleofpalms.gov by the questions deadline. Substantive clarifications and changes will be issued by City addendum on its Requests for Bids and Proposals webpage. Only written City addenda modify this solicitation. Bidders shall review and acknowledge all addenda; direct discussions with Rhythm or field personnel do not change the bid requirements.

Contract requirements

1 Agreement and schedule: The selected contractor shall execute a written agreement incorporating this RFB, its attachments and addenda, and the accepted bid. Obtain an Isle of Palms Business License before work. Work begins only after written notice to proceed. Coordinate fieldwork with availability of the required equipment, design information, existing Site A power, and applicable approvals. The contractor shall establish Site B power as part of the work before equipment energization and commissioning. Material scope changes or concealed conditions affecting cost or time require written City authorization before additional work.

2 Insurance and payment bond: Maintain commercial general liability coverage of at least $1,000,000 per occurrence and $2,000,000 aggregate, automobile liability of at least $1,000,000 combined single limit, and workers' compensation as required by South Carolina law. Provide certificates and applicable endorsements before work, naming the City as an additional insured on general and automobile liability coverage. If the contract exceeds $50,000, furnish a labor and material payment bond for the full contract amount meeting S.C. Code Section 29-6-250 before work begins.

3 Warranty and payment: Warrant workmanship and contractor-furnished materials for one year after written City acceptance. Follow Rhythm's procedures to preserve manufacturer warranties; correct damage or warranty loss caused by the contractor. Rhythm-furnished equipment retains its manufacturer warranty. Submit itemized invoices for completed work; payment will follow the agreement and applicable law, with final payment subject to completion, required records, and City acceptance.

Public records and compliance: Bids are subject to the South Carolina Freedom of Information Act. Clearly identify information claimed to be exempt and state the legal basis; marking information confidential does not establish an exemption. By signing its bid, the bidder certifies compliance with applicable requirements of Title 8, Chapter 14 of the South Carolina Code, agrees to provide documentation of applicability or compliance on request, and will require applicable compliance by its subcontractors and sub-subcontractors.

Attachment A

Rhythm Engineering Contractor Package, Revision 2, September 29, 2026, provided as a separate PDF. Includes the project-specific Contractor Installation Instructions, the In|Sync Installation and Maintenance Guide v3.2, and the eagle|EYE Installation Guide v1.0, Chapters 1 through 8. The generic guides apply only to the equipment and configuration specified for this project. Site-specific drawings and additional bid details will be issued to all bidders by addendum before the written-question deadline, allowing time for review and clarification.

City of Isle of Palms, South Carolina
RFB 2026-10 Bid Form
IOP Connector Adaptive Traffic Signal Installation

Company: _____

Address: _____

Contact: _____ Phone: _____

Email: _____

Price component	Amount
Site A installation, including cameras, cabinet equipment, and cabling	$_____
Site B installation, including electrical power supply, camera, enclosure, and cabling	$_____
Common costs not included above, including traffic control, permits, testing, and commissioning	$_____
Total base bid for the complete project	**$_____**

Repeaters with associated PoE injectors included in base bid: _____ sets.

Calendar days after notice to proceed to complete work: _____

Addenda acknowledged by number and date: _____

Exceptions: None _____ or attached _____

Attach the qualifications, references, subcontractor list, and schedule required by this RFB. Do not count shared costs twice. The total base bid includes all work described in the issued bid documents for both sites.

By signing below, I confirm that I am authorized to bind the bidder, have reviewed the RFB, Attachment A, issued drawings, and addenda, and offer to perform the complete scope for the stated price. I agree to the bid terms and the compliance certification in this RFB.

Authorized signature: _____ Date: _____

Printed name and title: _____

CONTRACTOR INSTALLATION INSTRUCTIONS

In|Sync Adaptive Signal System and Eagle|Eye

Client City of Isle of Palms
Project AI Controlled Traffic Signal System
Signalized Intersection Palm Boulevard / 14th Avenue at the Isle of Palms Connector, Isle of Palms, SC
Existing Cabinet Model 332 cabinet with 2070 controller
Issued By Rhythm Engineering, LLC, 14019 W 95th St, Lenexa, Kansas 66215
Field Support Brody Boothe, Installation Manager, brody@rhythmtraffic.com, 913-227-0603 x127
Technical Support 913-674-9846, office hours, Central Time
Revision Rev 2, September 29, 2026 (supersedes Rev 1 issued September 14, 2026)

This document provides high-level installation guidance for the licensed, SCDOT-approved signal contractor engaged by the City. It is a summary only. Detailed cut-sheets, camera placement drawings, and the site-specific design package will be issued by Rhythm Engineering prior to installation, and the contractor is expected to work from those documents in the field. Rhythm's In|Sync Installation and Maintenance Guide (v3.2, April 2025 edition) is attached as Attachment A, and the eagle|EYE Installation Guide (v1.0, Chapters 1 through 8) is attached as Attachment B. Section references below refer to those guides.

1. Work Locations

Location	Equipment to Install
Site A: Signalized intersection (Palm Blvd / 14th Ave)	Four (4) In|Sync detection cameras with mounting hardware, and the In|Sync in-cabinet hardware (processor, site equipment panel, C1 Y-cable, cellular modem).
Site B: Existing wooden utility pole east of the intersection	Stand-alone queue detection site. Eagle|Eye camera mounted on the pole, and a NEMA enclosure on the pole housing the Eagle|Eye processor, 12 VDC power supply, 48 VDC PoE injector, network switch, and cellular modem. Queue data is sent to the In|Sync processor over the cellular link. There is no connection to a signal controller at Site B.

2. Materials: Who Supplies What

Item	Supplied By	Installed By
In|Sync processor, site equipment panel, C1 Y-cable	Rhythm Engineering	Contractor
In|Sync detection cameras (four)	Rhythm Engineering	Contractor
Camera mounting hardware (Site A and Site B)	Rhythm Engineering	Contractor
Eagle|Eye camera, Eagle|Eye processor, NEMA enclosure, DIN-rail power supplies, PoE injector, network switch	Rhythm Engineering	Contractor
Cellular modems (pre-configured), one per site	Rhythm Engineering	Contractor
Repeaters and PoE injectors (runs over 100 m only; not included in the quoted scope)	Contractor (available for purchase from Rhythm Engineering)	Contractor
Power cable (14 AWG, 3-conductor, shielded, direct-burial rated)	Contractor	Contractor
Outdoor-rated Category 6A Ethernet cable and connectors	Contractor	Contractor

Item	Supplied By	Installed By
Conduit, grounding and bonding materials, banding straps or pipe clamps for pole mounting, misc. hardware, traffic control, permits	Contractor	Contractor

Note: Rhythm Engineering supplies the items shown above as supplied by Rhythm Engineering; Rhythm does not install them. The contractor installs all Rhythm-supplied equipment, including the in-cabinet components (In|Sync processor, site equipment panel, C1 Y-cable, and cellular modem), and supplies all power and communications cable, as specified in Section 3. Rhythm provides remote support only.

3. Contractor-Supplied Cable Specifications

Note: The cable specifications in this section supersede those in the In|Sync Installation and Maintenance Guide. Where the guide calls for Cat 6 Ethernet cable or IMSA 20-1 power cable, use the cables specified here.

3.1 Ethernet Cable (camera and communications runs)

- Category 6A F/UTP (overall foil shield with drain wire), outdoor direct-burial rated, with water-blocking inner jacket or tape.
- 4 twisted pairs, 23 AWG solid bare copper conductors, tested to 750 MHz, ETL listed to TIA-568-C.2.
- Reference product: Show Me Cables Cat6A Outdoor Direct Burial Shielded Solid Water Block Cable, SKU 85-665-636BK (Primus Cable), per the spec sheet provided by Rhythm, or equivalent.
- Connectors must be shielded Cat6A RJ45 plugs rated for solid 23 AWG conductors and the cable's outside diameter (reference: Show Me Cables CN1-021-8C6SH, or equivalent). Bond the cable drain wire to the connector shield.
- Any cable run exceeding 100 meters (328 feet) requires a repeater and PoE injector. These are not included in the quoted scope and can be purchased from Rhythm Engineering. Verify all run lengths and notify Rhythm before ordering.
- Leave 10 feet of spare Category 6A cable at the east-facing mast arm camera mounting (see Section 4).
- Terminate both ends with the T-568B pinout.
- Test every run per Section 5 before connecting any camera.
- Equivalent cable meeting this specification is acceptable. Submit its cut sheet to Rhythm Engineering for approval before purchase.

3.2 Power Cable

- 14 AWG, 3-conductor, shielded, direct-burial rated power cable, supplied by the contractor. Any cable meeting this description is acceptable.
- At Site A, routed from the traffic cabinet to each camera location in accordance with the site design package.
- At Site B, routed from the 120 VAC power source at the pole to the NEMA enclosure.
- Leave 10 feet of spare power conductor at the east-facing mast arm camera mounting (see Section 4).
- All power work, grounding, bonding, and surge protection to be performed in accordance with SCDOT standards, the NEC, and applicable local electrical code. Bond and ground the NEMA enclosure at Site B.

Cut-sheets for both cable types are available from Rhythm Engineering on request. Request them before ordering material.

4. Installation Sequence

1. Attend the kickoff and remote technical/installation meeting with Rhythm Engineering to confirm scope, schedule, and site-specific requirements.

2. Receive and inventory all Rhythm-supplied equipment. Verify all components against the packing list and report any shortages or damage within 5 business days of delivery, and in all cases before installation begins. If any shipping damage is found, photograph it and send the photos to Rhythm Engineering upon receipt.
3. Verify camera mounting locations and cable run lengths at both sites against the Rhythm-issued design package before pulling any cable. Any run over 100 meters (328 feet) needs a repeater and PoE injector, which are not in the quoted scope and can be purchased from Rhythm Engineering; notify Rhythm before ordering.
4. Site A: Install the Rhythm-supplied camera mounting hardware on the signal structures at the pre-approved locations.
5. Site A: Pull and terminate power and Ethernet cable from the controller cabinet to each camera location, using the shortest run possible to each approach. Leave 10 feet of slack at the cabinet and 5 feet at each camera.
6. **Site A: At the camera mounting on the east-facing signal mast arm, leave 10 feet of extra Category 6A cable and 10 feet of extra power conductor as coiled slack for future use.** Secure and protect the slack so it does not strain terminations or hang in the roadway.
7. Site A: Mount the four detection cameras and connect wiring per Rhythm specifications. Do not final-aim at this stage.
8. Site A (contractor installs all in-cabinet Rhythm equipment): Install the site equipment panel in the traffic cabinet. Mount the In|Sync processor and connect it to the Ethernet switch. Install a 14 AWG ground wire from the equipment panel ground bar to the cabinet ground bus bonded to earth ground (Attachment A, Section 4.4).
9. **Site A: Connect the processor to the 2070 controller with the Rhythm-supplied C1 Y-cable (Attachment A, Section 7.7).** With the controller in flash: plug J4/OUT into the processor OUTPUT port, J5/INPUT2 into INPUTS 2, and J6/INPUTS1 into Aux/INPUTS 1; move the existing C1 cable from the controller to the Y-cable's female C1 connector. Take the controller out of flash, then plug the Y-cable's male C1 connector into the controller. No detector cards or RG cable are required.
10. **Site B (stand-alone, no controller connection):** Confirm the pole owner has approved the attachment before mounting anything on the pole. Mount the Eagle|Eye camera on the pole 25 to 30 feet above ground with banding straps or pipe clamps, aimed at the queue area designated by Rhythm (Attachment B, Chapters 3 and 5). Mount the NEMA enclosure on the pole, assemble the processor, power supplies, PoE injector, and switch on the DIN rail (Attachment B, Section 8.1), and connect 120 VAC power to the enclosure. Run tested Category 6A cable from the camera to the PoE injector. Attachment B Chapters 9 and 10 (controller connections) do not apply.
11. Install the pre-configured cellular modems at Site A and Site B. Rhythm Engineering provides all IP addressing and modem configuration. No network configuration or IP assignment is required by the contractor or the City.
12. **Test every Ethernet run per Section 5 and send the results to Rhythm Engineering. Do not connect any camera until its run has passed.**
13. **Obtain written authorization from Rhythm Engineering before energizing any Rhythm equipment.**
14. After authorization, connect the cameras to power, verify each camera communicates with the Ethernet switch, and confirm remote connectivity at both sites.
15. Call Rhythm Technical Support (913-674-9846, office hours, Central Time) to verify camera connectivity and views. Rhythm will direct final camera aiming, zoom, and focus.
16. Remain available to return to site during system integration to adjust cameras or correct any cabling issues.

5. Cable Testing Procedure

Every Category 6A run must be tested after termination and before any camera is connected. Finding a bad run after the cameras are up costs a return trip.

Warranty: plugging an Ethernet cable into a camera before the run has been tested voids the camera warranty.

1. Verify cable distances. Any run over 100 meters (328 feet) needs a repeater (not in the quoted scope; available for purchase from Rhythm Engineering).
2. Pull cable to each approach using the shortest run possible.
3. Test each terminated run with a cable qualifier that verifies length, wire map, resistance, frequency, and insertion loss margin: Fluke Networks CableIQ (CIQ-100) or an equivalent or better tester. Twist each connector while testing to catch loose crimps. Other brands are acceptable; follow the manufacturer's instructions for the tester used.
4. Label each test report by camera and approach and email all reports to brody@rhythmtraffic.com. Re-terminate or replace any run that fails, then retest.
5. After Rhythm's written authorization, connect the cameras to power and verify each camera communicates with the Ethernet switch.
6. Call Rhythm Technical Support at 913-674-9846 (office hours, Central Time) for help verifying camera connectivity and angles.

6. Mandatory Hold Points

Do not proceed past any of these points without the approval shown.

Hold Point	Requirement
Mounting equipment on the Site B utility pole	Pole owner attachment approval confirmed by the City.
Connecting cameras or other Rhythm equipment to power	Written authorization from Rhythm Engineering, issued after passing cable test results are received.
Placing In|Sync into detector or adaptive mode	Written authorization from Rhythm Engineering required first.
Substituting any specified cable, connector, or hardware	Submit to Rhythm Engineering for written approval before purchase.
Final camera aiming and focus	Performed under Rhythm Engineering remote direction.

7. Provided by the City

The following are the City's responsibility and are noted here so the contractor can coordinate:

- Power at the traffic cabinet (Site A) and a 120 VAC power source at the Site B pole.
- Attachment approval from the Site B pole owner (the City is coordinating with Dominion Energy).
- Existing traffic engineering data: counts, phasing, timing plans, amber and all-red times, and pedestrian timings.

8. Questions and Field Support

Rhythm Engineering provides remote technical support during office hours, Central Time. Schedule field work that needs Rhythm support within those hours, and contact Rhythm before improvising a field fix. A short call before the work is always cheaper than a return trip after it.

Brody Boothe, Installation Manager: brody@rhythmtraffic.com, 913-227-0603 x127
Technical Support: 913-674-9846, office hours, Central Time
Hardware RMA requests: brody@rhythmtraffic.com

Richard Cole, General Manager, Rhythm Engineering, LLC

ATTACHMENT A

In|Sync Installation and Maintenance Guide

v3.2, April 2025 edition (237 pages)

Where this guide conflicts with the contractor instructions above, the contractor instructions govern.

RHYTHM ENGINEERING

InSync



INSTALLATION AND MAINTENANCE GUIDE

v3.2/April 2025

In|Sync

INSTALLATION AND MAINTENANCE GUIDE

This guide is designated as an overview and explanation of In|Sync, In|Sync:Fusion and In|Sync:Thermal system parts and components for traffic engineers, signal technicians and contractors.

Note: It is important that the parties responsible for the installation and maintenance of In|Sync carefully read through the details of this manual prior to installing, maintaining or monitoring the system.

PN: 510-00014

Document Version 3.2
March 2025

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This product contains open source software. Notices and licenses are provided in the In|Sync WebUI's Help documentation or within the In|Sync Kiosk online help and are incorporated herein by reference.

While every precaution has been taken in the preparation of this document, the publisher and the author assume no responsibility for errors or omissions, or for damages resulting from the use of information contained in this document or from the use of programs and source code that may accompany it. In no event shall the publisher and the author be liable for any loss of profit or any other commercial damage caused or alleged to have been caused directly or indirectly by this document.

In|Sync is protected by U.S. Patent Nos. 8,050,854; 8,103,436; 8,253,592; 8,653,989; 8,922,392 B1; 8,253,592 B1 and other patents-pending.

Rhythm Engineering
14019 W 95th St, Lenexa, KS 66215
913-227-0603
info@rhythmtraffic.com

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Chapter 1. Introduction

In|Sync is an adaptive traffic signal system developed by Rhythm Engineering that uses our In|Sync Processor's artificial intelligence with:

- Our video detection system (In|Sync or In|Sync:Thermal) or
- Our video detection fused with your existing detection devices (In|Sync:Fusion)

These elements are integrated into a system that automatically optimizes local traffic signals and coordinates signals along roadway arterials according to real-time traffic demand.

This guide provides the required information to install In|Sync, In|Sync:Fusion and In|Sync:Thermal. It is intended for use by traffic engineers and technicians who are responsible for installing and setting up traffic monitoring equipment.

For information on monitoring the In|Sync software, refer to the In|Sync WebUI User Guide. For information about configuring In|Sync intersections using the In|Traffic configuration management tool, refer to the Configuration Management Software User Guide.

1.1. How In|Sync Works

Traffic coordination at an intersection has traditionally been managed by a cabinet's traffic controller using timing plans created for expected traffic conditions. With the introduction of In|Sync, coordination can now be managed using real-time traffic conditions instead of historically expected conditions. The installation involves:

- Installing the In|Sync Processor, an industrial-grade microcontroller that integrates with the traffic cabinets and controllers via industry standard connections.
- Installing detection cameras.

For In|Sync and In|Sync:Thermal installations, the detection cameras determine how many cars are present in each lane. For In|Sync:Fusion installations, detection cameras are used in conjunction with existing detection methods to determine queue at an approach. With this queue estimation derived from real-time traffic demand, the processor is then able to determine real-time adaptive coordination.

1.1.1. In|Sync installation: A two-phase process

The installation of an In|Sync system consists of two phases:

Hardware Installation

- Install the In|Sync equipment.
- Confirm camera views.
- Configure the In|Sync intersection using the Configuration Management application.
- Grab camera backgrounds.
- Map controller inputs and outputs.
- Connect In|Sync to cabinet/controller.
- Test all of In|Sync's outputs with the controller.
- Confirm that In|Sync is receiving all the information that it needs from the field inputs.
- Confirm that In|Sync is sending all the information that it needs to send to the controller and that the controller is receiving the signal.
- Complete the installation checklist. The intersection is now in Detector mode.

> ***Note:*** *There is no difference in how traffic is serviced before In|Sync was installed and after In|Sync is installed and set to Detector mode.*

Adaptive Turn On

- Change settings on the controller (referred to as "Freeing up the controller") so that the controller is no longer responsible for coordination. See page 193 for instructions on freeing up the controller.
- Turn In|Sync's Adaptive mode on

> ***Note:*** *One significant change in how you perform your job after switching to Adaptive mode is in how you view detection presence. You will not be able to accurately view presence through the*

controller's display. Instead, you must use the In|Sync Kiosk or WebUI to view placed calls. This can be done either through a monitor and keyboard connected to the processor (at the cabinet), a laptop connected to the network (at the cabinet), or through a computer remotely connected to the processor.

Why is this? Because In|Sync places concurrent calls to the controller on the same side of the barrier to prevent the "max timer" for active phases from counting, thus allowing In|Sync to control "Green Time"

The only way to accurately view detections on the controller's display is to switch back to Detector mode. However, putting the In|Sync Processor back into Detector mode will break coordination, as the controller will still be in Free mode (no coordination). One option to guard against having no coordination at an intersection is to set up the Free Mode pin to run a default timing plan (see page 169 in the Troubleshooting chapter for more information on the Free Mode function).

What is Detector mode?

Detector mode is a state in which the In|Sync Processor simply sends detector inputs directly to the controller, allowing the controller to continue to be responsible for traffic coordination, just like it was before In|Sync was installed. After installing the In|Sync Processor, you should run Detector mode for two weeks to verify that inputs are being received, outputs are being sent properly and sufficient historical data is captured for configuring adaptive operation. This two-week time period also allows for enough time to get all intersections installed, running and tested with the In|Sync Processor.

What is Adaptive mode?

Adaptive mode is a state in which the In|Sync Processor analyzes queue and chooses the phases and sequences that best serve actual traffic demand. During Adaptive mode, the system determines priority so it can serve approaches intelligently. The system chooses from the states (concurrently permissible phasing) available to it and requests the traffic controller actuate green lights accordingly.

What is CameraIO?

Every once in a while, the term "CameraIO" appears in the In|Sync Installation and Maintenance Guide. The term "CameraIO" refers to the part of the In|Sync software that reads and processes images coming from each camera (video detection), which is then

sent to the In|Sync WebUI. A separate instance of CameraIO runs for each camera at the intersection. You can view each camera's CameraIO process through a button on the In|Sync Kiosk.

1.2. Related Documents

The In|Sync WebUI User Guide provides complete information about monitoring the In|Sync software and is available by contacting Rhythm Engineering. The In|Sync Kiosk Online Help provides complete information regarding the use and operation of the In|Sync software on the In|Sync Processor. The In|Traffic Configuration Management User Guide provides information regarding configuring In|Sync intersections and adaptive configurations.

1.3. Supported Cabinets

In|Sync is compatible with NEMA TS-1 / TS2 Type 1 and Type 2 / ATC Architecture / and 170/2070 Architecture.

1.4. User Guide Conventions

This document uses these conventions and symbols for notes, cautions and warnings:

Field Names

This style indicates that the text will be found on a clickable button on a screen.
For example:

> Click the **Back** button to return to the Web page you last viewed.

[Keyboard function]

A key on the keyboard is shown in this style. For example:

> Optionally, to move between fields you can use the **[Tab]** key.

`User input`

Text that the user has to type, either on the command line, or into a text box on a screen, is displayed in this style. In the following example, text is displayed in this style:

> To log into the WebUI using the default view access, type `User` into the Log In dialog box.

Note

Means reader take note. Notes contain helpful suggestions or references to materials not contained in this manual.

⚠ CAUTION

Means reader be careful. In this situation, you might do something that could result in equipment damage or loss of information.

WARNING

Means that you are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents.

1.5. Contact Rhythm Engineering Support

Rhythm Engineering technical support will ensure that the fast and easy access that you have come to expect from your In|Sync products will be maintained.

Web access	Email access	Telephone access
www.rhythmtraffic.com	Technical requests can also be sent to info@rhythmtraffic.com	913-6-Rhythm (913-227-0603)

Chapter 2. Establish Network Communications

2.1. In|Sync's Networking Needs

The In|Sync system involves individual intersections that talk to each other to facilitate progression of traffic along a corridor. This "talk" happens via Internet Protocol (IP) communications through the interconnect. IP communication is a robust and proven technology that has allowed the Internet to evolve.

> ***Note:*** *The word "Internet" in Internet protocol can be a little misleading – it is not necessary for the network to be open to the rest of the world. Typically the network used by In|Sync is either sequestered behind firewalls or totally isolated. Municipalities with an existing networking plan can often just incorporate the traffic network into their broader networking scheme.*

2.1.1. Interconnect communications (between intersections)

In order for In|Sync to coordinate traffic between intersections, some route for IP communications must exist between the intersections. IP communication can occur over many types of physical infrastructure, including fiber optic cable, Ethernet cabling, twisted-pair cabling or wireless radio technologies. These physical connection technologies can be mixed and matched as appropriate, even within the same corridor.

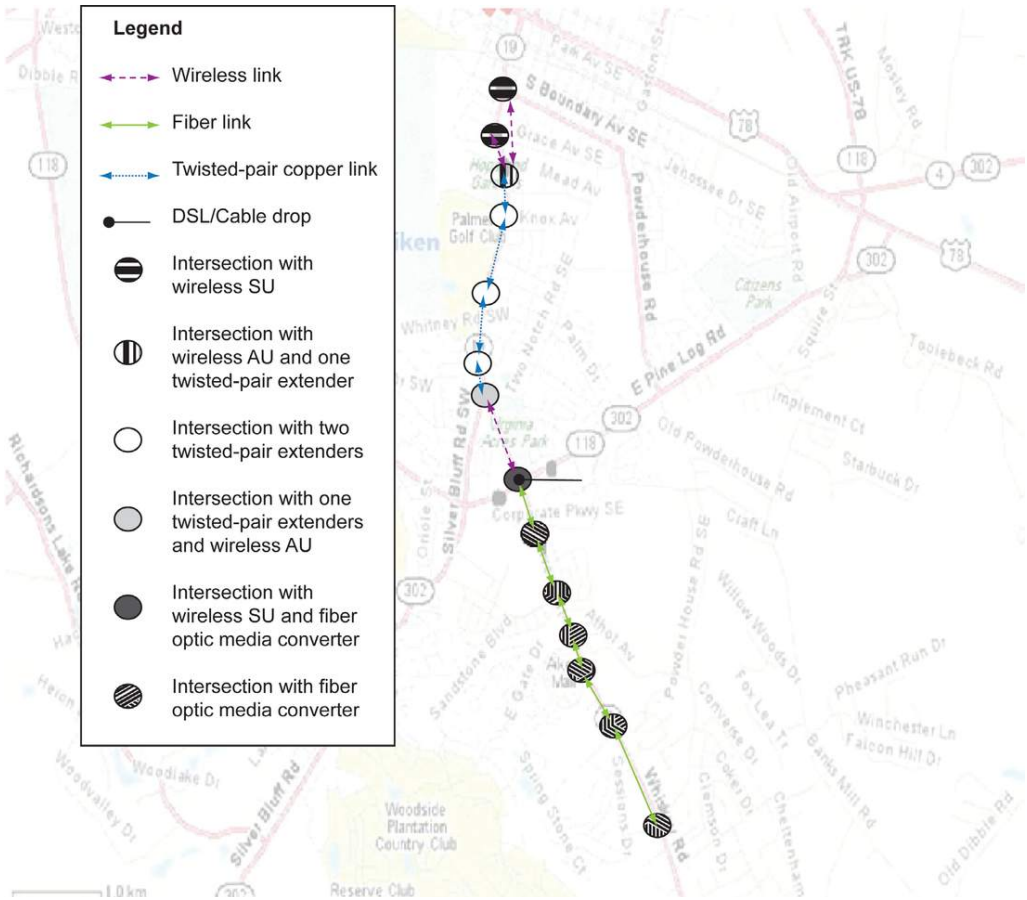


Figure 2-1. Sample mixed network schematic

In Figure 2 - 1, a DSL drop is located at the intersection that is closest to the phone company's central office. This provides the best DSL line speed.

> ***Note:*** *The top two intersections are not directly connected to each other. Any IP traffic between them is automatically routed through the third intersection.*

How intersections communicate to each other is the backbone of signal coordination. Interruptions in the network can be tolerated quite well, as each intersection will continue to attempt coordination based on the last information it received. But the corridor will be unable to change in response to network-wide traffic changes. During a prolonged network outage, the synchronization that provides the best progression could start to deteriorate.

2.1.2. Communications at an intersection

In addition to the network along the corridor, the In|Sync hardware provided for each intersection creates a 100 Mbps network inside the traffic cabinet for communication between the cameras and the processor. This traffic remains local. It is not sent to the corridor network. Only intersection-to-intersection traffic or intersection-to-outside world traffic goes onto the corridor network.

2.1.3. Remote communications

In|Sync does not contain a "central server" that directs the intersections in their daily operation. Rhythm Engineering uses the outside network connection purely for configuration and monitoring purposes. However, in order for Rhythm Engineering to activate In|Sync adaptive control, you must fully enable local and remote communications between intersections. This allows the traffic engineers at Rhythm to:

- Provide technical support remotely during the installation process and after activating In|Sync
- Provide software updates to the system when available
- Confirm camera views remotely
- Configure the In|Sync adaptive system
- Monitor the behavior of the system

In addition to providing timely information to Rhythm support staff, many agencies are interested in using monitoring tools for observing the corridor. It is possible to pull intersection imagery into a Traffic Management Center using the provided tools or by integrating with products like TransSuite from TransCore or MIST from Telvent.

There are several ways to provide a remote connection. For locations where the corridor network is part of a larger network infrastructure, it is generally possible to obtain Virtual Private Network (VPN) access. This is arranged through the agency's local IT department.

For a corridor network that stands alone, an outside connection can happen through a standard Digital Subscriber Line (DSL) from the local phone company. Many cable

companies also offer networking via cable modems. This public network connection plugs into a router, which provides a secure gateway that prevents unauthorized personnel from accessing the network.

2.1.4. In|Sync networking requirements

Before installing In|Sync, be sure to have the following networking items in place:

- A fully configured and installed router with VPN and firewall capabilities
- VPN access for at least four unique Rhythm users
- Static IP address assignments for each In|Sync device with designated subnet/gateway.
- Minimum bandwidth of 2 megabits per second (Mbps) download speed and 1 Mbps upload speed.

> ***Note:*** *The only networking equipment provided by Rhythm Engineering is the network switch that resides on the equipment panel (for communications at the intersection). All other networking equipment must be purchased separately.*

IP Address Requirements

Rhythm Engineering normally requests that eight static IP addresses exist per intersection. This requirement ensures that there is one static IP address per In|Sync network device (cameras, processor), plus three to five designated open static IP addresses for technicians to use when on-site. In the following cases, we require a certain number of IP addresses based on the number of cameras:

- Five IP addresses per a three-camera system
- Six IP addresses per a four-camera system
- Seven IP addresses per a five-camera system
- Nine IP addresses per a six-camera system (since the maximum amount of video one In|Sync Processor can process is for five cameras, two extra IP addresses are required for a six camera system - one for the sixth camera and one for an extra In|Sync Processor)

> ***Note:*** *Add three to five designated OPEN static IP addresses per corridor for technicians to use on-site.*

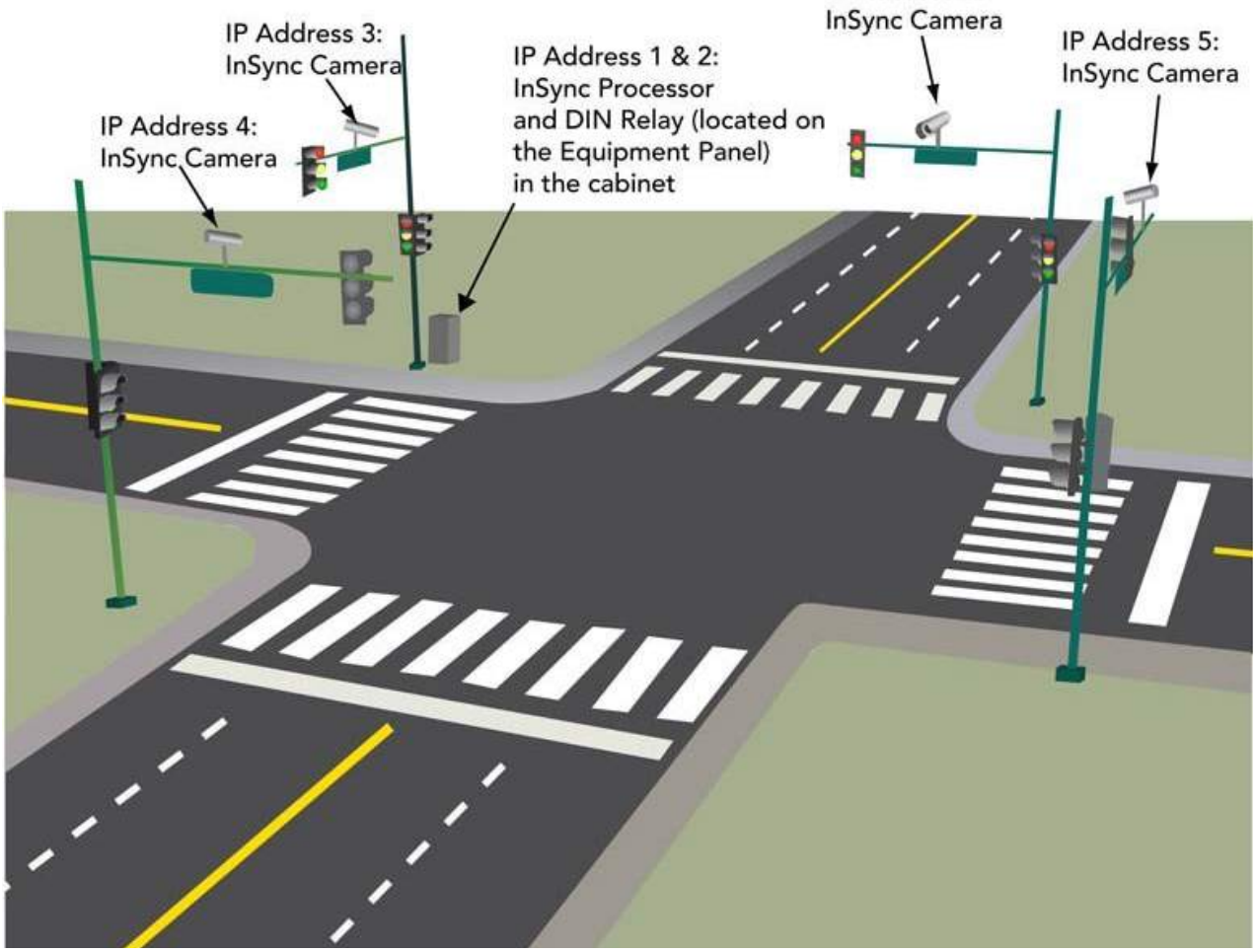


Figure 2-2. IP Address Assignments for a four camera system

VPN/Port Requirements

If you are using a VPN for network communications, prior to installation you will need to establish communication to the VPN, test communications throughout the complete corridor network and then provide remote connectivity to Rhythm Engineering.

> ***Note:*** *Rhythm Engineering requires a minimum of 2 Mbps download and 1 Mbps upload speed.*

Rhythm engineers will need:

- HTTP access (port 80) and/or HTTPS access (port 443) to the WebUI and each In|Sync network device (In|Sync Processor, monitoring camera, DIN Relay and Ethernet repeater)
- TCP for RDP access (port 3389) to each In|Sync Processor
- SMTP access (port 25) for outbound access to Rhythm mail server at at 98.100.100.2 (notify.rhythmtraffic.com)
- Port 20000 TCP for In|Sync communications
- Port 5000 and 5001 for WebUI to In|Sync processors. Allows the processor to broadcast the Hawkeye UI which is used to see real-time radar detection and access stored data.
- Port 50000 TCP for In|Sync Camera Images/Status
- Port 554 for RTSP port
- Port 4520 for device control and streaming for ActiveX Control
- Port 943 for Silverlight policy
- Port 123 for NTP (outbound to NTP server 74.222.222.166)
- Multiple user access for at least four user accounts via the VPN connection
- A router that has been installed and configured to enable VPN capabilities
  DNS:
  - » Primary: 8.8.8.8
  - » Alternate: 8.8.4.4

2.2. Networking Bandwidth

"Bandwidth" is the amount of network communication traffic that can flow through a given point. Think of bandwidth as plumbing and water as traffic. A small copper pipe allows a small stream of water to flow, but to get more water to the other end faster, you need a larger diameter pipe. Similarly, if you need more network traffic to get to the other end faster, you need more bandwidth. Water traffic can be measured in cups or gallons; network traffic is measured in "bits" and "bytes." A byte equals eight bits.

Note: *Be careful when reading specifications that mix bits per second (bps) with Bps (bytes per second). For example, a 100 Mbps connection is slower than a 50 MBps connection (50 MBps = 400 Mbps). There is also confusion regarding the definition of "kilo." In some computing contexts, it means 1024; in others it means 1000. Similarly, "mega" can mean either 1,000,000 or 1,048,576 (1024 x 1024). However, these numbers are close enough in practical terms to not matter.*

Communication Methods	Bandwidth under Ideal Conditions*	Limitations
Fiber Optic	10 Gbps (10,240 Mbps) @ 50 km/ 30 miles	
Ethernet	1 Gbps (1024 Mbps) @ 100 m/ 325 ft	
Twisted-pair Copper Cabling	25 Mbps @ 600 m/2000 ft	Hardware must be in good condition to achieve higher throughput
Wireless	54 Mbps	Throughput varies depending on distance and amount of vegetation/buildings between antennae; typical speeds range from 5 to 20 Mbps; throughput also is dependent on the WiFi standard being used; currently standard 802.11n offers up to 300 Mbps
DSL/Cable Modem **	128 Kbps - 1.5 Mbps	DSL lines are not available everywhere; throughput is strongly dependent on the distance between the DSL modem and the telephone central office switch

* All bandwidth speeds are raw throughput speeds and do not count networking overhead, which can use up to 30+% of the bandwidth.

** DSL and cable modem connections typically advertise their speeds as something like 1.5 to 10 Mbps. However, this is the download speed. In|Sync communications is more dependent on upload speeds.

2.2.1. In|Sync's network bandwidth requirements

Operational

The operational corridor bandwidth used by In|Sync is very small — on the order of 300 bytes per second (0.3 Kbps or 0.0003 Mbps). Video network traffic is much heavier, but is kept within the intersection's network. Only short notification or status messages are sent between intersections.

Monitoring

The largest bandwidth usage across the corridor network is for monitoring purposes. The ideal network bandwidth to support a twelve-intersection corridor using the monitoring system provided by Rhythm Engineering is approximately 2 Mbps. This returns data from 48 cameras with a refresh rate of once per second. However, the monitoring system is very tolerant of restricted bandwidth, degrading gracefully in a constrained situation. For example, if the available bandwidth dropped to 1 Mbps, the refresh rate would be slowed down to once per 2 seconds. This reduction occurs and recovers automatically as soon as more network bandwidth becomes available.

Video Streaming

The network cameras can also directly provide MPEG-4 video streams. The exact bandwidth required for a MPEG-4 stream can vary greatly depending on the complexity of the image, but is probably around 256 kbps for a 24 frames-per-second video stream.

2.2.2. Networking hardware

An 8-port Ethernet switch is included on a standard In|Sync Equipment Panel within each intersection's traffic cabinet. This is an unmanaged 100 Mbps network switch. The switch keeps traffic that is only needed at the intersection local (e.g. the video stream from the cameras that is processed by the processor).

Fiber Optic

A fiber optic connection uses a media converter to interface with Ethernet. The converter has two ports for fiber, one “in” and one “out,” and a single Ethernet port for connecting to the equipment panel’s Ethernet switch. The cables that are used for connecting the Ethernet fiber switch plug into the existing fiber patch panel are shown in Figure 2 - 3.



Figure 2-3. Fiber patch cables

Copper

A twisted-pair connection can be supported using a twisted pair Ethernet extender. It connects directly to the twisted-pair wiring and has an Ethernet port for connecting to the equipment panel’s Ethernet switch. One Ethernet extender unit must exist on each end of a twisted-pair run. Intersections in the middle of the corridor requires two of these units.

Wireless Network

A wireless network segment uses one Access Unit (AU) and one Subscriber Unit (SU). Attach each to an antenna, ensuring that it has a near line-of-sight to the other unit. Typically the SU has a directional antenna, but an AU might have either an omni or a directional antenna (depending on how many units are connecting to it and the physical layout of the wireless network). Each unit has an Ethernet port for connecting to the equipment panel’s Ethernet switch.

DSL or Cable Modem

A DSL drop uses a standard DSL modem to connect to a telephone company line. A cable modem behaves just like a DSL modem; it connects to a coaxial cable network. The connection must have a static IP address, but can be physically located anywhere along a

corridor. The modem has an Ethernet port that connects to a router, which will handle the Virtual Private Network (VPN) security for access from the outside to the corridor network. The router also connects to the equipment panel's Ethernet switch to gain access to the corridor network.

> ***Note:*** *In instances where the distance is more than 100 m. (approximately 320 ft.) between the camera and the equipment panel, we recommend installing an Ethernet repeater. An Ethernet repeater restores signal to original strength, supporting 100 m. from the repeater location. There are a wide variety of Ethernet repeaters out on the market today. Refer to your product's instruction manual for instructions on how to install a repeater.*

2.2.3. Example Cabinet Schematics

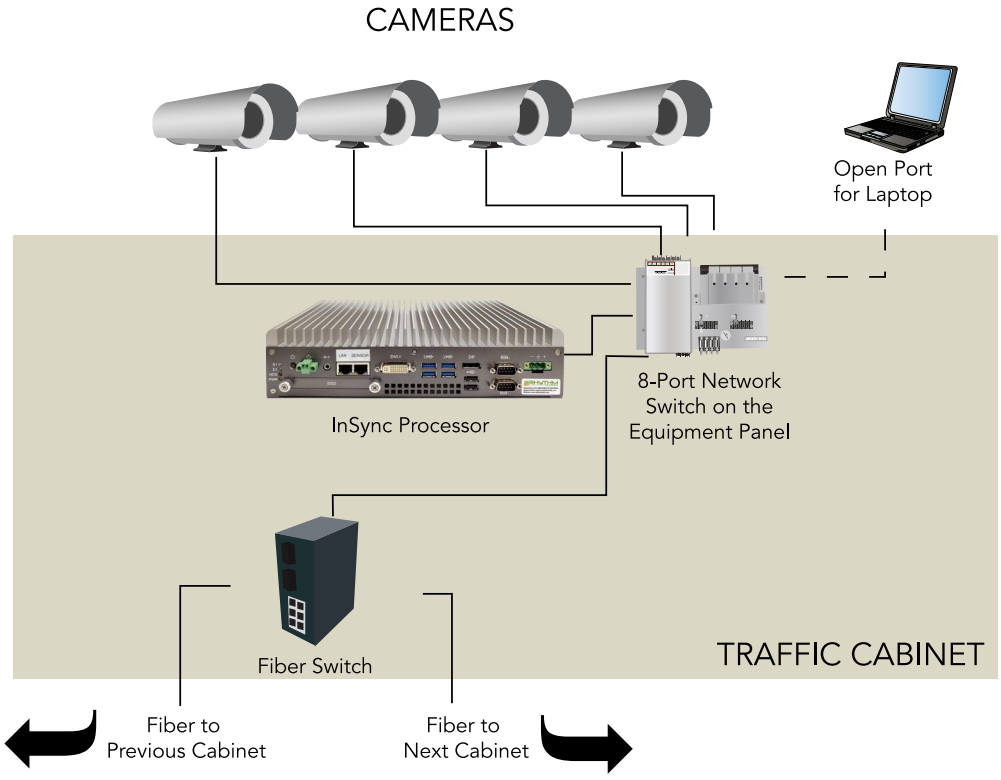


Figure 2-4. Network communications using fiber

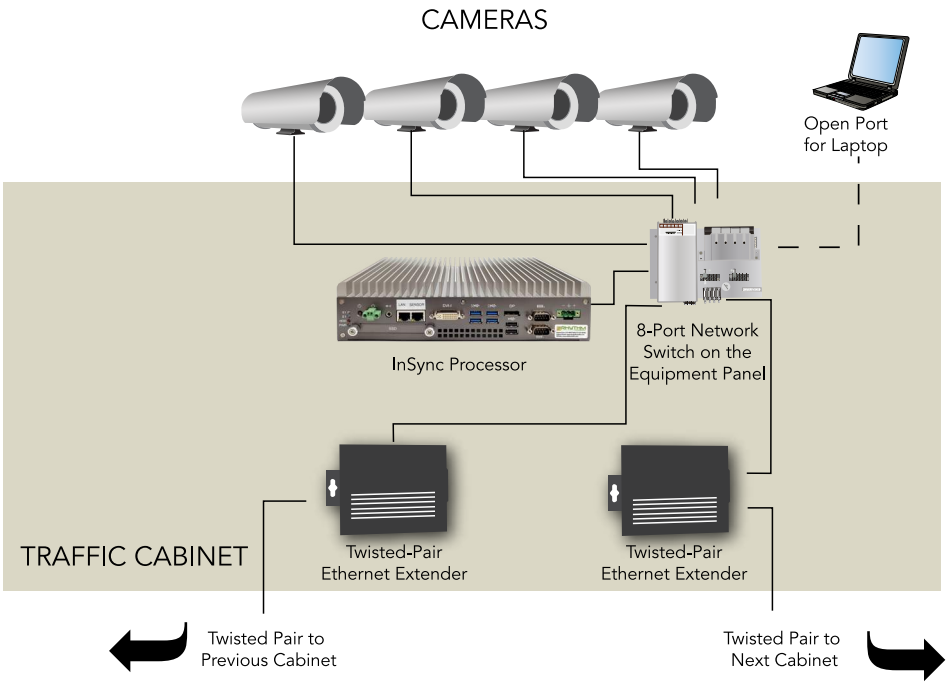


Figure 2-5. Network communications using copper

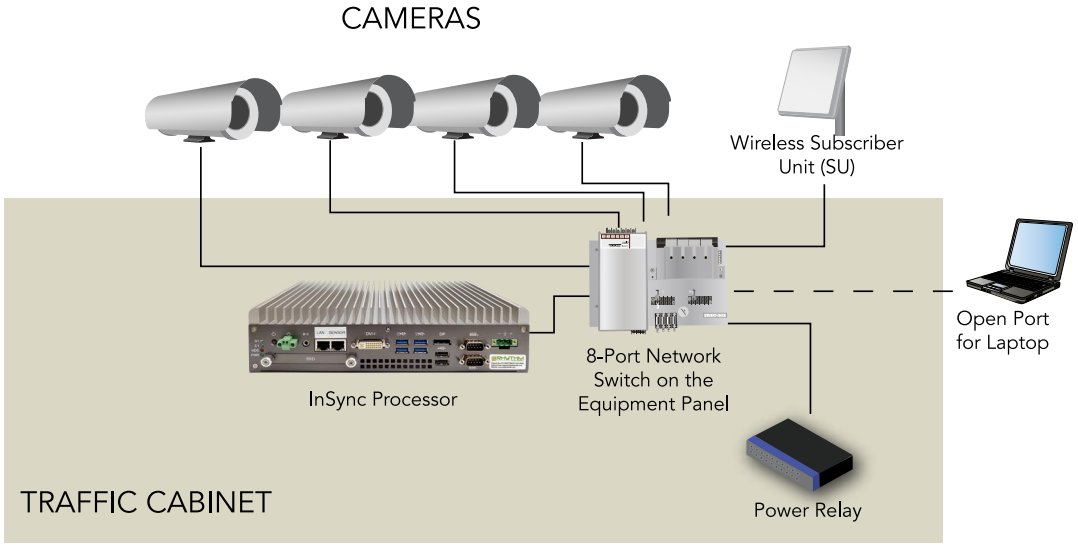


Figure 2-6. Network communications using wireless radio

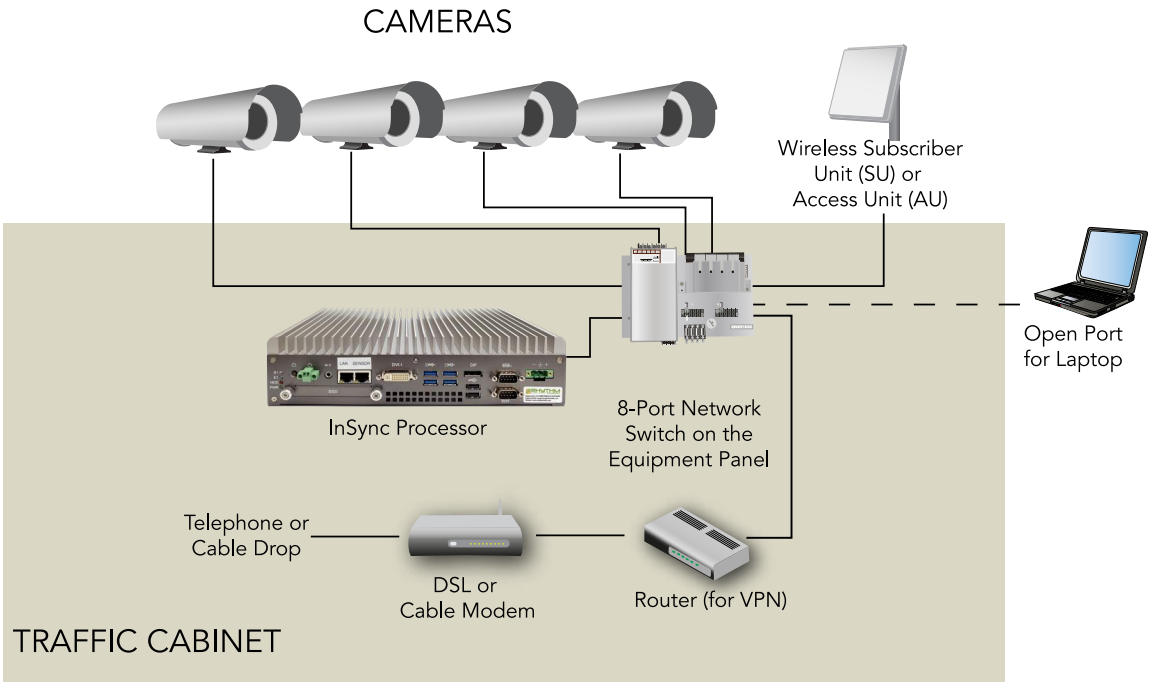


Figure 2-7. Network communications using wireless radio and DSL

Intersections with multiple devices in addition to normal In|Sync system hardware (see Figure 2 - 7) may require a second unmanaged Ethernet switch to accommodate all the devices's networking needs.

2.3. Installing an Ethernet Repeater

In instances where the distance is more than 320ft. (100 m), between the camera and the equipment panel, we recommend installing an Ethernet repeater and Power over Ethernet Injector (PoE). The Ethernet repeater boosts Ethernet signal strength. The PoE powers the repeater.

The PoE Injector is installed in the traffic cabinet while the repeater, housed within a submersible Fibox enclosure, is installed roughly halfway between the equipment panel and camera(s).

2.3.1. Assembling the Ethernet Repeater

In instances where the distance between the camera/radar and the equipment panel is more than approximately 328ft. (100m), Rhythm Engineering recommends installing an Ethernet extender a.k.a. repeater, and a PoE injector. The Ethernet repeater boosts the Ethernet signal strength. The PoE injector is installed in the traffic cabinet, as shown on Fig. 2 - 20 and Fig. 2 - 21. While the market offers different makes and models of extenders, we recommend Veracity Outreach Max XT. The instructions below pertain to the recommended model.

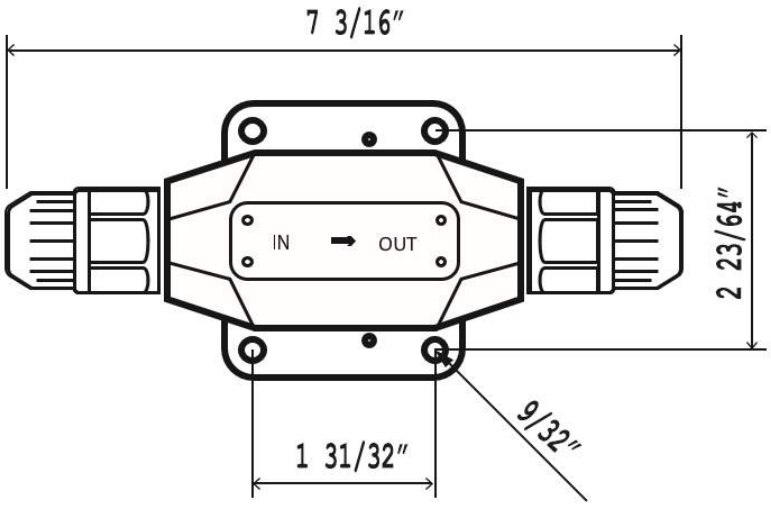


Figure 2-8. Ethernet extender dimensions

Dimensions and Mounting Holes

- The mounting plate is 2 33/64″ x 2 29/32″ x 5/64″ (64mm x 74mm x 2mm). The enclosure is 3 15/16″ x 1 31/32″ x 1 3/16″ (100mm x 50mm x 30mm).
- Warning exposure to strong direct sunlight may heat the product beyond its operating specification, shade where possible.
- Do not mount the product within a second outdoor enclosure. Thermal insulation combined with solar heating may result in high internal temperatures.

Gasket Sizes

Check the cable gasket fit. For wider cables, the gasket can be removed and replaced. Two alternative-size gaskets are included.



Figure 2-9. Cable gasket Cable



Figure 2-10. Matching cable size to gasket

Cable Gasket	Cable Diameter	Example Cable
Black (fitted)	3/16" - 1/4" (4.7 - 6.5mm)	Cat 5e UTP, Cat 6 UTP
Green	15/64" - 5/16" (6.0 - 7.8mm)	Cat 5e, Cat 6 STP, Cat 6a
Red	9/32" - 23/64" (7.0 - 9.0mm)	Double Shielded, older Cat 6a

Fitting the Mounting Plate

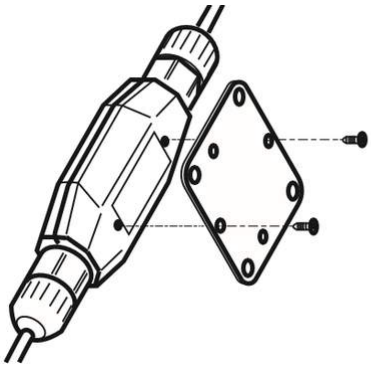


Figure 2-11. Extender with mounting accessories

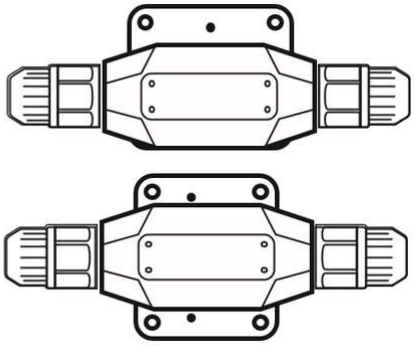


Figure 2-12. Plate mounting variations

1. Attach the product to the mounting plate using the two screws supplied. (Fig. 11)
2. The plate can be attached in two different orientations to suit the installation. (Fig. 12)
3. Mount the product horizontally where possible.

> ***Note:*** *Ensure nothing can push on the connectors & that the cables are supported and not in tension.*

Fitting Connectors

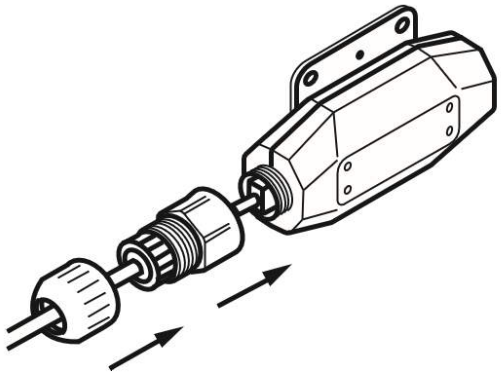


Figure 2-13. Physical connection components

1. Fit the cable cover parts over the cable, loosely assembled or separately in the order shown:
    - Fit a standard (shielded or unshielded) RJ45 plug to the cable and connect it to the product;

- OUTREACH Max XT should be connected to PoE-compatible equipment only.

2. Connect the RJ45 plug to the product.
   - Check the RJ45 plug clicks into place securely;
   - Fit the cable casket into the connector nut if it is not already in place;
   - Check the cable gasket is fully inserted;
   - Check the red O-ring is present.

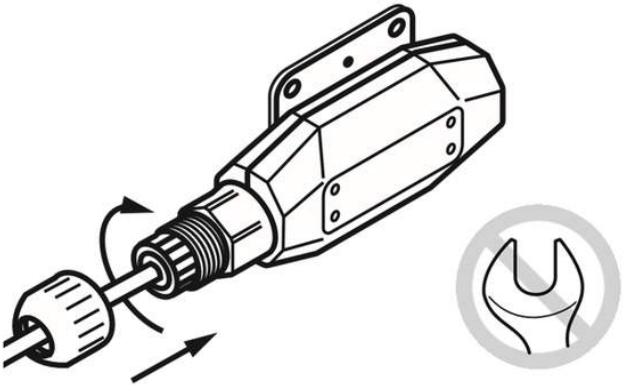


Figure 2-14. RJ45 Connector attached to extender

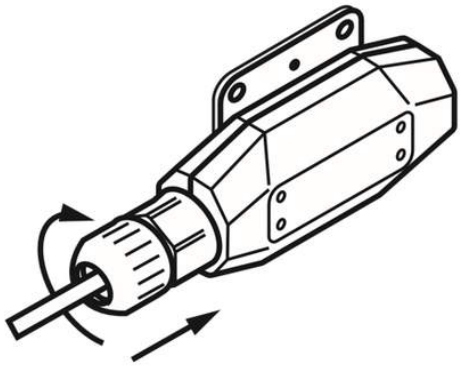
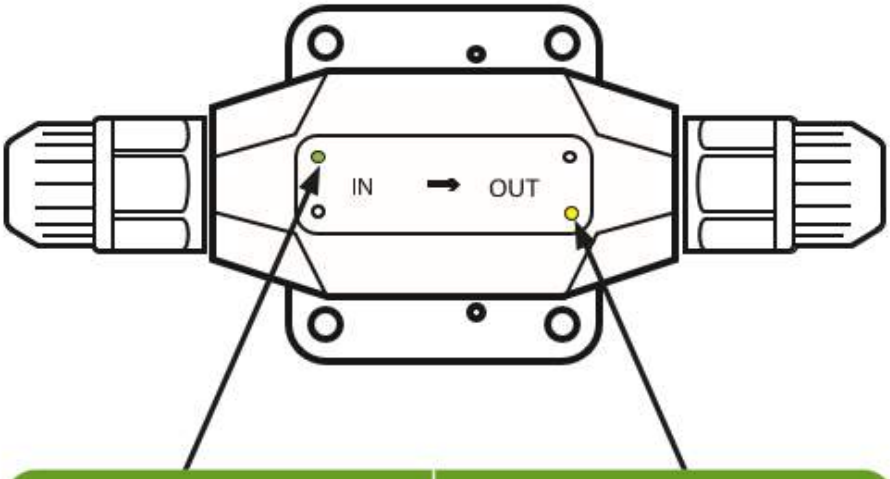


Figure 2-15. Cable nut fastened to connector

3. Tighten the connector nut firmly **by hand**.
   - The connector nut should nearly contact the enclosure when fully tightened.
4. Tighten the cable nut firmly by hand. The cable nut should contact the connector when tightened.
   - The cable gasket should compress firmly around the cable without bulging or rippling.

LED Indicators

OUTREACH MAX XT is transparent to PoE and will power up when both the PoE and powered device are ports connected.



POWER (Green)	LINK/Activity (Yellow)
ON Power good	ON Link
OFF No PoE	FLASH Activity

Figure 2-16. LED lights schematic

Ethernet and PoE Extension

To extend Ethernet with PoE, use OUTREACH Max XT to connect cable sections of up to 328ft. (100m).

- OUTREACH devices use standard Cat 5e/6 type Ethernet cable and RJ45 connectors, and auto-detect rate and crossover;
- OUTREACH Max XT should be connected to PoE-compatible equipment only.

Increasing Range and Power

Two or more OUTREACH Max XT devices may be used to create full-bandwidth connections over 656ft. (200m) repeater, by joining multiple cable sections of up to 328ft. (100m) each.

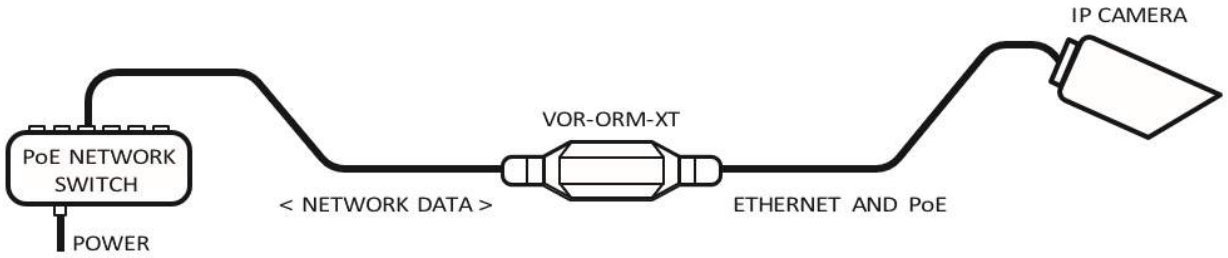


Figure 2-17. Connection schematic with one extender

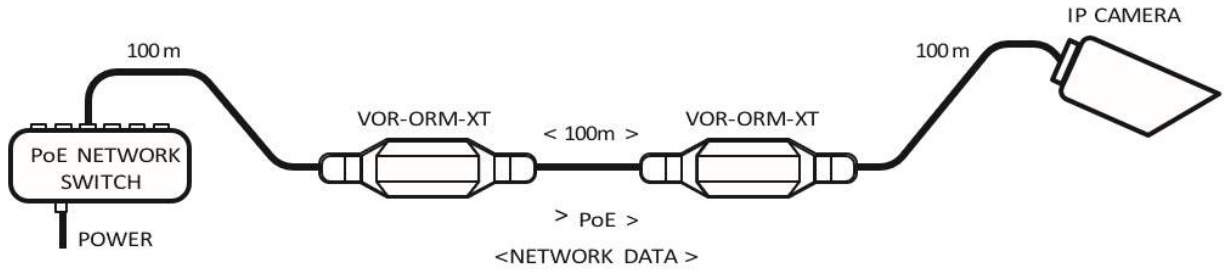


Figure 2-18. Connecting to power schematic with two extenders (100m = 328ft.)

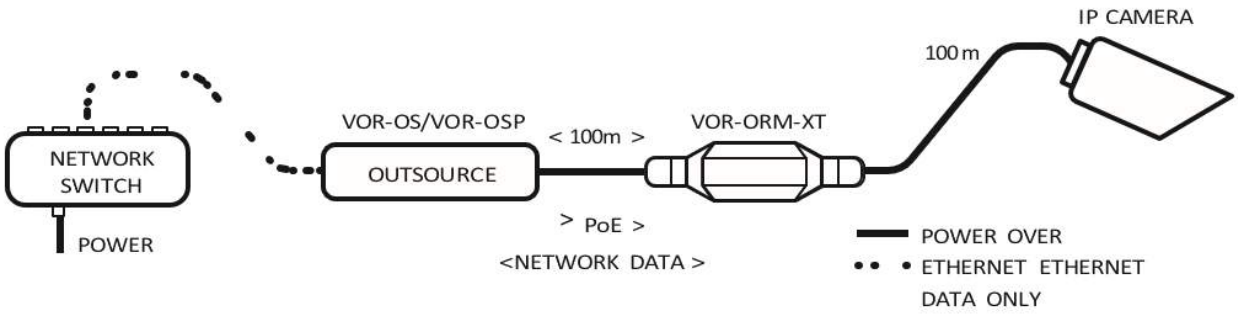


Figure 2-19. Maximizing connection through combination of extenders

Maximum Range

Maximum range for camera power up to (Watts) is given in the table below:

PoE Source	No PoE	5W	10W	15W	20W	25W
1 EEE 802.af switch	1640ft. (500m)	984ft. (300m)	656ft. (200m)	N/A	N/A	N/A
OUTSORCE	1640ft. (500m)	1,312ft. (400m)	984ft. (300m)	N/A	N/A	N/A
1 EEE 802.af switch	1640ft. (500m)	984ft. (300m)	984ft. (300m)	656ft. (200m)	656ft. (200m)	N/A
OUTSORCE	1640ft. (500m)	1,312ft. (400m)	1,312ft. (400m)	984ft. (300m)	984ft. (300m)	656ft. (200m)

> ***Note:*** *The connectors on the Outreach Lite and Outreach Max are rated IP66, which is an Ingress Protection rating. IP66 rating means it can withstand water sprayed with high pressure at the connectors. It does not mean that the repeater is protected if it is immersed in water. if deployed below street level, please place the repeater in a waterproof box or enclosure.*

2.3.2. Installation Steps

1. Prepare the submersible Fibox enclosure for installation:
    - Each Fibox enclosure comes with three IP67 cable glands (provided, but not installed).
    - Allow for 1 cable IN, 1 cable OUT per camera requiring a boosted signal.
    - Install the cable glands on the sides of the Fibox enclosure.
2. Place the Fibox enclosure roughly halfway between the camera and the traffic cabinet in an available pull-box.

3. Install the repeater in the Fibox enclosure.
    - Splice the CAT6 Shielded, Burial rated cable at the repeater location and feed both ends of the cable through the provided cable glands.
    - Identify and label which CAT6 Shielded, Burial rated cable end is coming from the traffic cabinet (LINE).
    - Plug the LINE cable into the port labeled Ether1 on repeater.
    - Identify and label which CAT6 Shielded, Burial rated cable end is going to the camera (LOAD).
    - Plug the LOAD cable into one of the ports labeled Ether2, 3, 4, or 5 on repeater.

> ***Note:*** *Do not seal the Fibox enclosure until communications to the camera have been verified*

4. Mount the PoE injector near the equipment panel in the traffic cabinet.
    - Find the CAT6 Shielded, Burial rated cable for the camera that needs a stronger Ethernet signal. Plug the cable into the RJ45 port labeled "PoE To Device" on the PoE Injector (opposite side of 110VAC Input).
    - Use an Ethernet patch cable to connect the PoE Injector to the Ethernet switch on the In|Sync Equipment Panel by plugging into the RJ45 port labeled "Switch Hub."
    - Supply power to the PoE Injector by plugging in the provided 110VAC power cable.
5. Verify communications to the affected camera(s).
6. Seal the Fibox enclosure with waterproof, industrial grade silicone adhesive gel suitable for direct burial and frequent flooding conditions.

> ***Note:*** *The repeater can boost the Ethernet signal to more than one camera if necessary. However, you still need a dedicated power supply for each camera.*

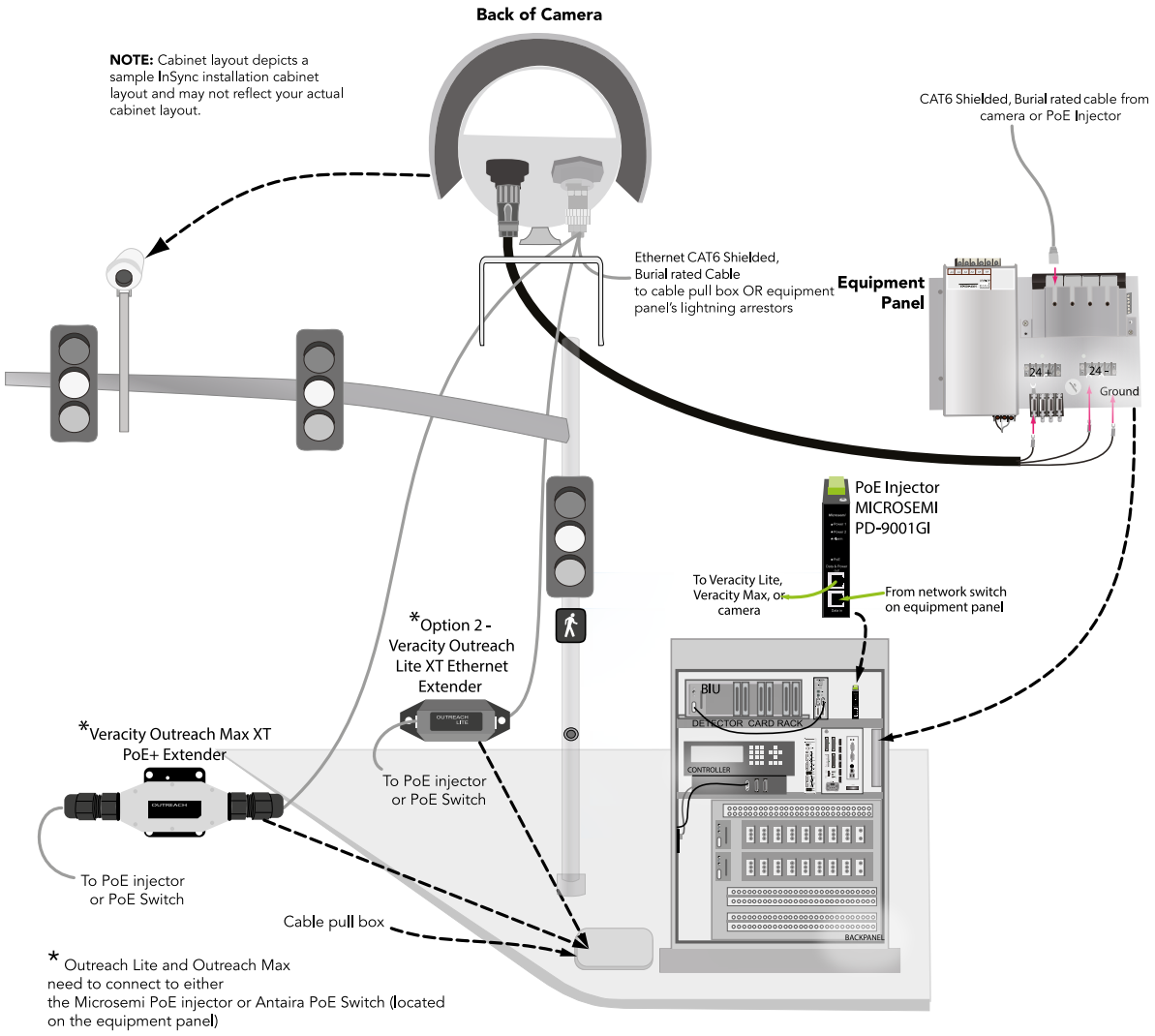


Figure 2-20. In|Sync and In|Sync:Fusion installation using an Ethernet Repeater

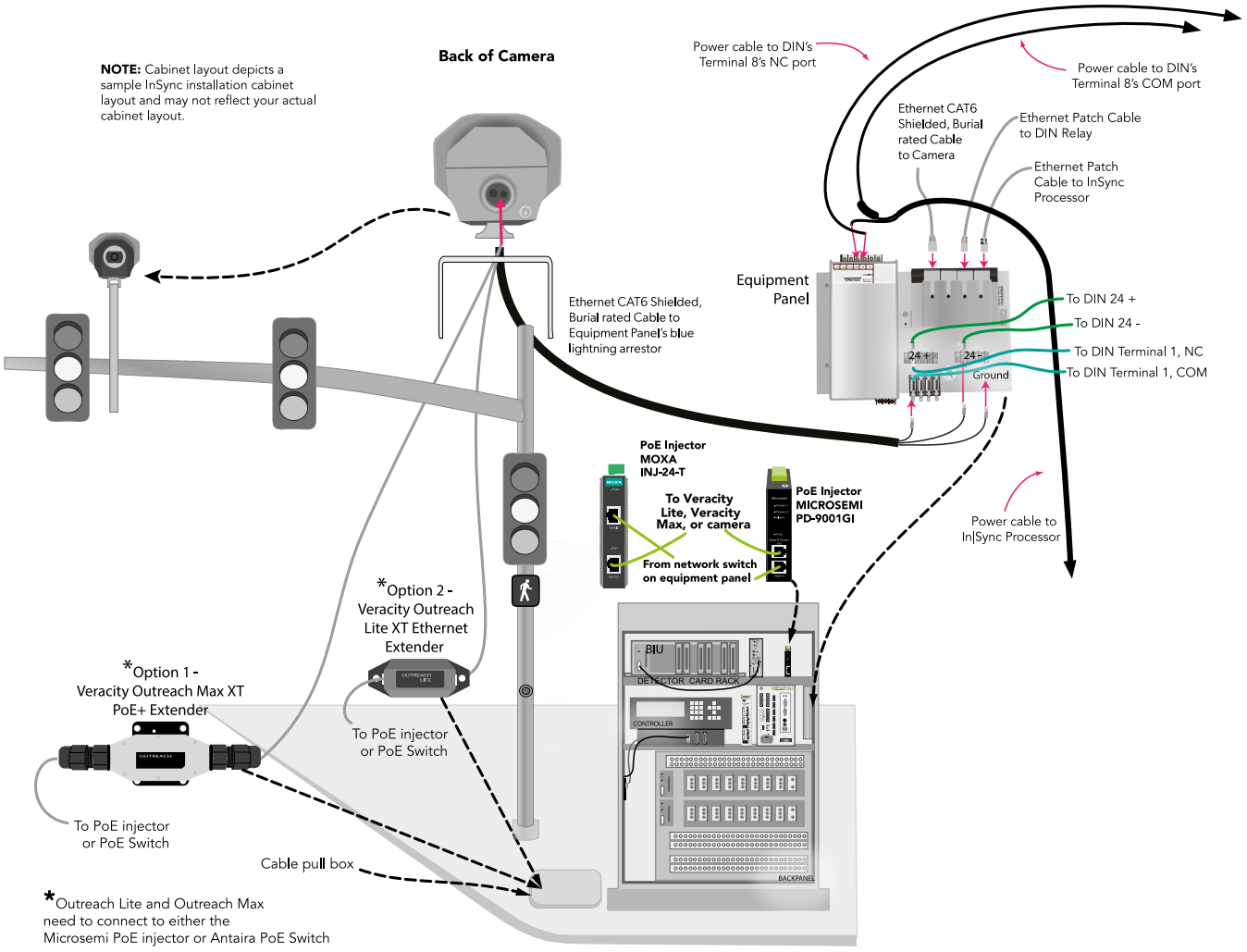


Figure 2-21. In|Sync:Thermal installation using an Ethernet Repeater

Chapter 3. System Components

At a typical intersection, there are several types of inputs available to In|Sync. With these inputs, In|Sync either:

- Uses the signals in its calculations (vehicle and pedestrian detections)
- Monitors the signals (light statuses, preemptions, miscellaneous)
- Disregards the signals (auxiliary informational signs, detector volume counts, etc.)

Before installing In|Sync, detector inputs come in from the field to the detector panel(s). These detector inputs are then routed to the controller. With the inputs that it receives from the field, the controller decides which phases to serve based on the active timing plan.

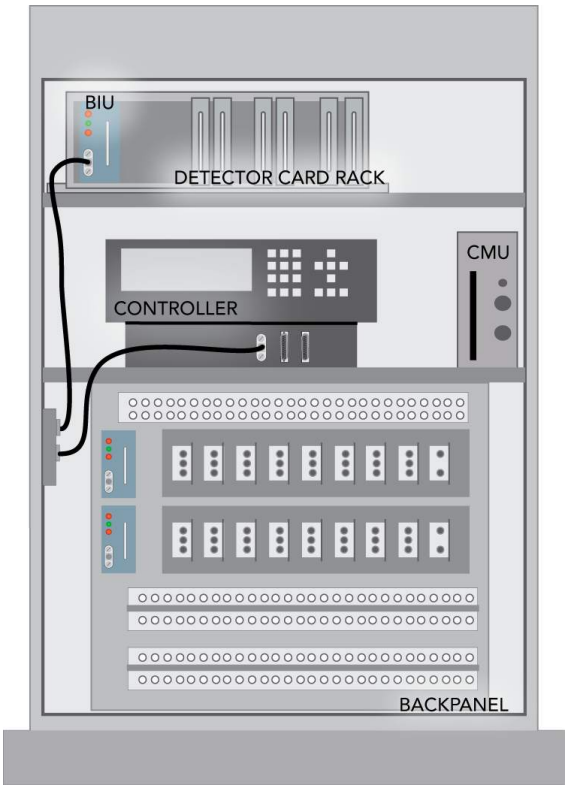


Figure 3-1. Example of detector inputs being sent to a NEMA TS2, Type 1 Controller using a SDLC connection before installing In|Sync

After installing In|Sync, all vehicle detector inputs coming from the field are captured by the In|Sync Processor. This method allows In|Sync to use the Traffic Controllers detector inputs to control which phases to serve at the appropriate time.

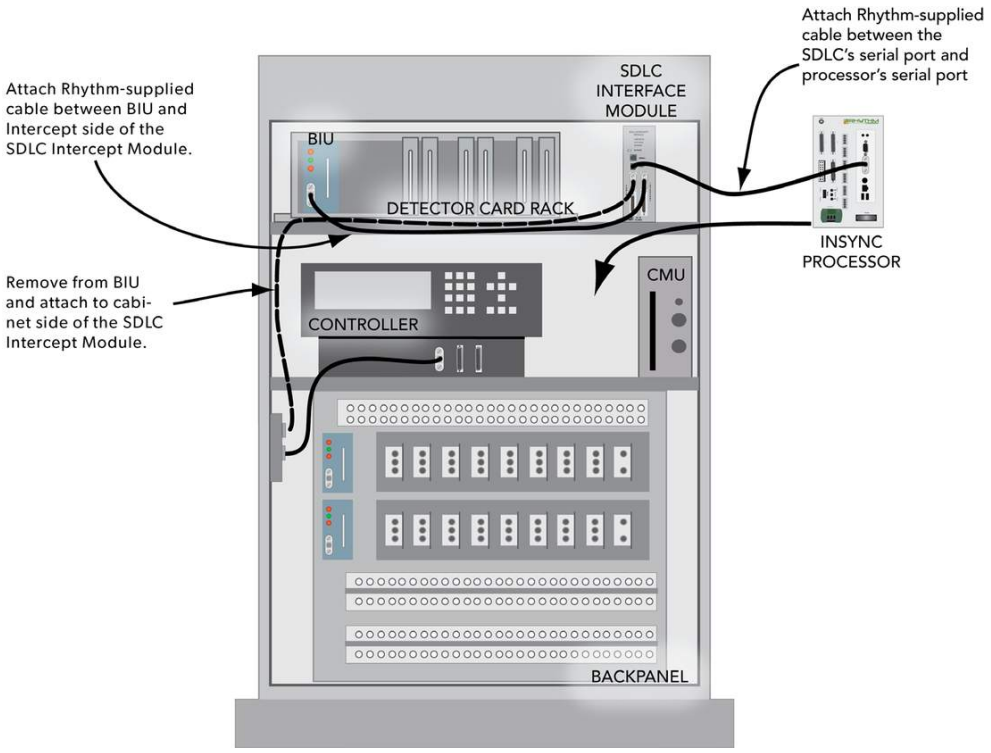


Figure 3-2. Example of detector inputs being sent to a NEMA TS2, Type 1 Controller with a SDLC connection after installing In|Sync and the SDLC Intercept Module

In some instances, you may want to pass detection inputs through to the traffic controller through an auxiliary detector input. This is true in situations where you are using detector data (such as volume and speeds) in a traffic management system. In those cases, you might need to use a Spade cable as an alternative connection type to enable that flexibility. See the "Installing Interception" chapter in the In|Sync Spade Cable Installation and Maintenance manual.

3.1. Package Contents

The following components are included with an In|Sync installation. Please verify that you have received each item for your particular installation.

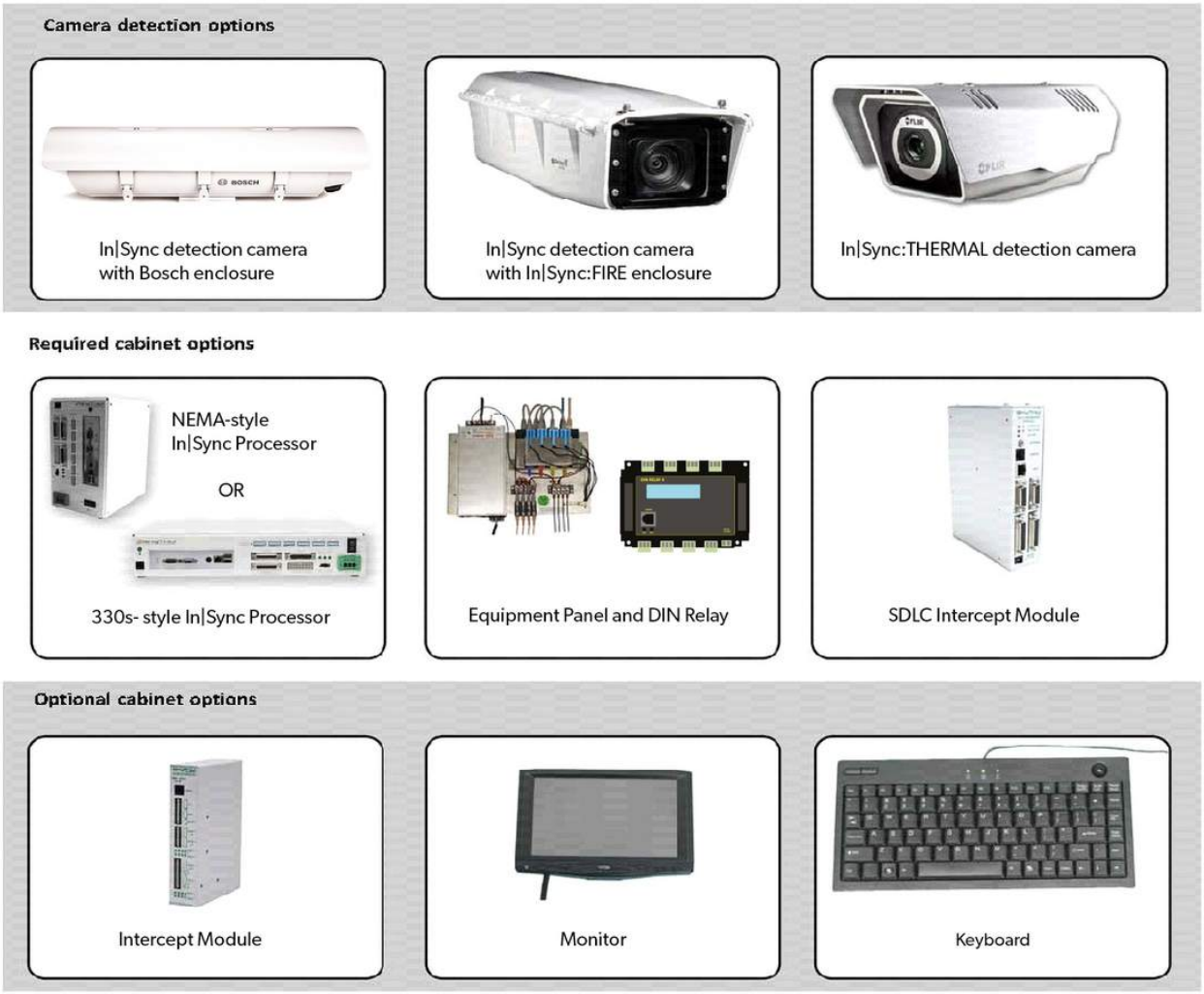


Figure 3-3. Package contents - In|Sync with the SDLC Intercept Module

3.1.1. Camera Component List

- Camera/Enclosure
- The type of camera/enclosure used for your installation is based upon each intersection's needs and is purchased accordingly. The camera bracket for each enclosure is mounted directly on the bottom of the enclosure.

- Pelco Camera Mounting Hardware
- CAT6 Shielded, Burial rated Cable
- Commscope P/N: 8841405/10 2003 Black ICAT5E cable (or Rhythm Engineering-approved equivalent CAT6 Shielded, Burial rated outdoor UV-resistant aerial/duct Ethernet cable). Recommended cables are available from an electrical supply house (such as Anixter, Accutech, or Graybar) and pulled from the traffic cabinet to the specified camera location. We recommend 10 ft. of slack left at the cabinet and 5 ft. of slack at each camera. If you are installing the camera in temperatures under 0° C/32° F, we recommend using the Belden 7937A Multi-Conductor - DataTuff® Waterblocked CAT6 Shielded, Burial rated Cable because it remains flexible in temperatures up to -25°C/-13°F
- Power Cable
- IMSA 20-1 Traffic Control Cable, which supplies power to the cameras/enclosures. (14-3 AWG Stranded Copper - For use in signal systems in underground conduit/duct or as aerial cable supported by a messenger.)

In addition to the provided materials above, you also need the following:

- Small flat blade screwdriver
- Phillips screwdriver
- Wire cutter/stripper and RJ45 crimper tool
- Bucket truck

3.2. Traffic Cabinet Component List

- In|Sync Processor
- Equipment Panel includes:
    - » Ethernet switch (communications hub for Ethernet connections)
    - » Ethernet-controlled DIN relay for cycling power to automatically restore network communications with cameras, manually recycle power to any individual camera and manually cycle power to the processor.

» Lightning arrestors for Ethernet cables (placed between camera and switch)

» 24 VDC power supply (110V/AC direct input, Ethernet switch, power to processors and cameras)

» Terminal blocks for camera power

» Circuit breaker

> ***Note:*** *If you are using the equipment panel as per Fig. 3-3, a separate DIN relay is provided. Also, this equipment panel does not include a circuit breaker.*

- Keyboard/Monitor (optional)
- Surge Protector
- SDLC Intercept Module and appropriate cables

3.2.1. In|Sync Detection Camera With BOSCH Enclosure

The In|Sync detection camera within a standard enclosure is used for detecting vehicles visually.

Each camera comes pre-sealed within the enclosure and connects to the network switch via an Ethernet cable. Power is supplied from the 24VDC power supply on the supplied equipment panel. Both power and Ethernet connections are located on the back of the enclosure, and each enclosure includes a standard internal heater.



Figure 3-4. Camera housed within a Bosch camera enclosure

We recommend the following color-coding scheme to distinguish camera cables:

- North-bound, blue (north is cold)
- South-bound, red (south is hot)

- East-bound, yellow (sunrise is in the east)
- West-bound, orange (sunset is in the west)

Each camera has a designated IP address, which identifies its position (NB, SB, EB, WB) and is labeled accordingly. It is important that each camera be mounted in the location corresponding to its IP address, which should be labeled on the camera. For example, "NB Camera" indicates the camera must be installed viewing oncoming traffic headed north.

3.2.2. In|Sync Detection Camera with In|Sync:FIRE Enclosure

The In|Sync detection camera also is available in the In|Sync:Fire camera enclosure. This camera visually detects vehicles, but it has the added benefit in that it utilizes Dotworkz's Ring of Fire enclosure for complete protection from the most rugged winter outdoor environments. Each camera comes pre-sealed within the In|Sync:Fire enclosure and connects to the network switch via an Ethernet cable. Power is supplied from a 24VDC power supply located on the equipment panel. Both power and Ethernet connections are located on the back of the enclosure.
The platform combines a twin flow fan array to force warm air around the camera. It also integrates 65-watts of heating elements that span the entire length of the housing and around the enclosure lens. This guarantees that all areas within the enclosure and the lens remain warm and ice-free. Finally, a multi-volt powering system controls when the heating element turns on to prevent icing on the outside of the enclosure. The enclosure melts snow and ice and eliminates any condensation that would normally obstruct a camera's view and interfere with the quality of vehicle detection.



Figure 3-5. Camera housed within an In|Sync:Fire camera enclosure

We recommend the following color-coding scheme to distinguish camera cables:

- North-bound, blue (north is cold)
- South-bound, red (south is hot)
- East-bound, yellow (sunrise is in the east)
- West-bound, orange (sunset is in the west)

Each camera has a designated IP address, which identifies its position (NB, SB, EB, WB) and is labeled accordingly. It is important that each camera be mounted in the location corresponding to its IP address, which should be labeled on the camera. For example, "NB Camera" indicates the camera must be installed viewing oncoming traffic headed north.

3.2.3. In|Sync:THERMAL Detection Camera

The In|Sync:Thermal detection camera is used for detecting vehicles through infrared energy that is emitted from objects. A thermal detection camera is really a sensor that contains millions of temperature probes for detecting tiny differences in infrared energy (heat) and converting it into electronic pulses. This signal is processed to produce a thermal image, which is represented in various colors, depending on the intensity of the infrared energy. In this way, In|Sync:Thermal cameras can see what normal In|Sync detection cameras cannot. Each camera connects to the network switch via an Ethernet cable and power is supplied from a 24VDC power supply. Both power and Ethernet connections are located through a single gland on the back of the enclosure and each enclosure includes an internal heater.



Figure 3-6. Camera housed within a camera enclosure

We recommend the following color-coding scheme to distinguish camera cables:

- North-bound, blue (north is cold)
- South-bound, red (south is hot)
- East-bound, yellow (sunrise is in the east)
- West-bound, orange (sunset is in the west)

Each camera has a designated IP address, which identifies its position (NB, SB, EB, WB) and is labeled accordingly. It is important that each camera be mounted in the location corresponding to its IP address, which should be labeled on the camera. For example, "NB Camera" indicates the camera must be installed viewing oncoming traffic headed north.

3.2.4. Processor

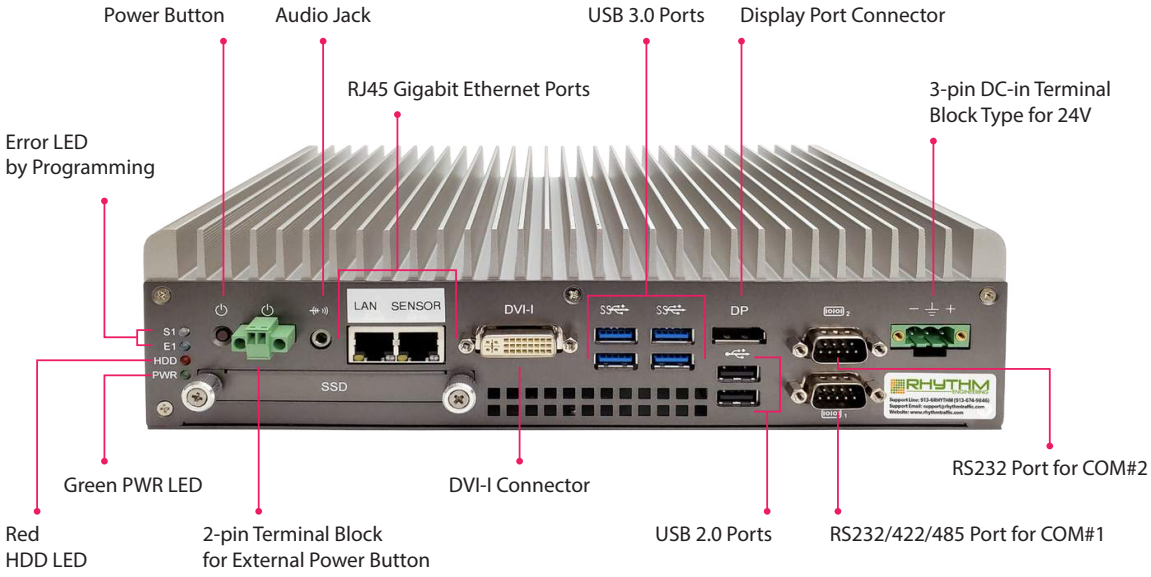


Figure 3-7. In|Sync Processor Types

The processor performs video image processing and traffic optimization for adaptive installations. The front panel includes several connectors:

Industrial motherboard connections (plastic faceplate):

- VGA video port for plugging into a monitor
- Network (Ethernet) port for networking
- USB ports for USB-based keyboards/mouse, or a USB flash drive for upgrades
- CPU LED to indicate that the motherboard is receiving power

Internal IO Board:

- IO Board Status LED indicators
- Adaptive/Detector MODE switch
- RJ45 port for detector cards
- RG cable port (collects red/green returns)
- Power switch
- 24VDC power connection (receives power from equipment panel)

The inputs on the IO board contain diodes that eliminate the possibility of triggering a signal, such as a preemption signal.

POS Board:

The POS Board contains 24 DIP switches that are used to control the powered off behavior of the 24 outputs. These 24 outputs correspond to the output number assigned in the software for each of the output pins. For more information about the POS board, see "Support drive instructions" on page 195.

⚠ WARNING: Do not connect the processor's detector card port to anything but a Rhythm detector card.

3.2.5. Equipment panel

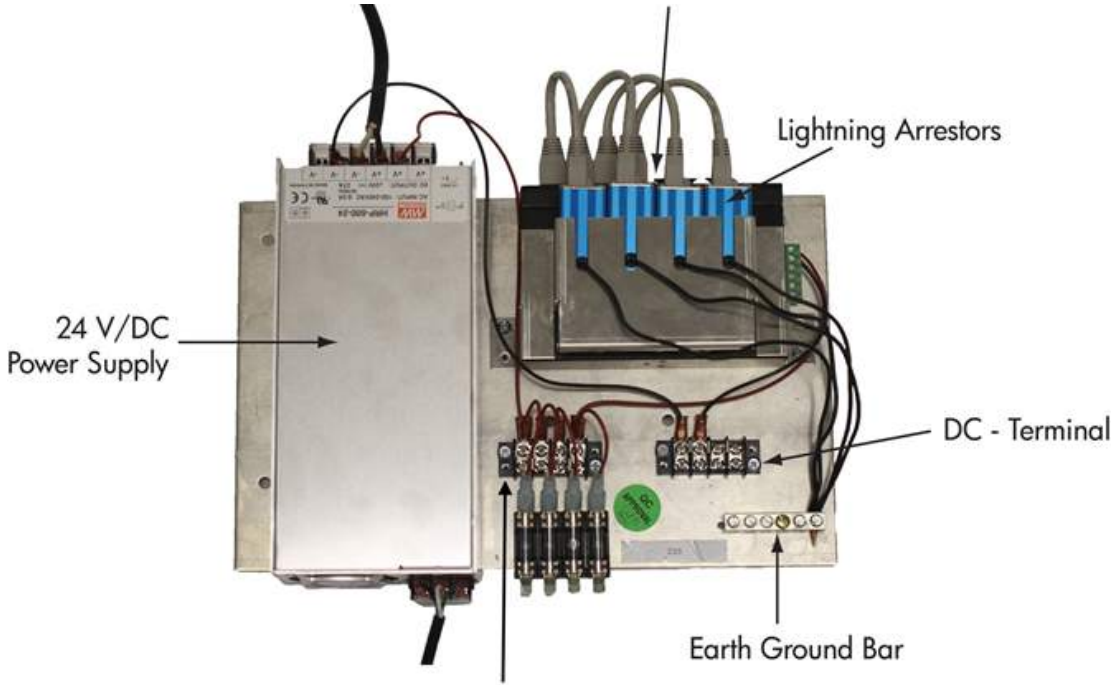


Figure 3-8. Equipment Panel

The following image shows the various parts of the Equipment Panel. The equipment panel houses the DC power supply, which provides power for the processor, cameras, DIN Relay and Ethernet switch. The switch serves as the hub of communications between the processor, network cameras and the outside network connection. Surge arrestors protect the rest of the system in case a surge travels down the CAT6 Shielded, Burial rated cable from the networked cameras and 4-amp fuses (Bussman BUS-BK/AGC-4) protect the system from high voltage traveling down the power wire from the camera and protects the cameras from over voltage.

The 24 VDC power supply plugs into a standard 110V AC power source. The camera power cables connect to the equipment panel. The + lead connects to the quick connect near the 4-amp fuse, the negative directly to the DC-terminal block and ground to the Earth ground bar. A cable harness is constructed to take the DC+ from the terminal block to the DIN NC and from the DIN common back to the equipment panel quick connect on the inner side of the fuse block. The panel must be tied to earth ground at the ground bar. In addition, the DIN Relay cable harness connects the processor's DC+ to the equipment panel through the DIN Relay.

The camera's Ethernet cables connect at the bottom of the lightning arrestors. The processor and exterior network cables are plugged directly into the top of the network switch.

Power from Surge

The 24 VDC power supply plugs into a standard 110V AC power source. The camera power cables connect to the equipment panel. The + lead connects to the DC+ terminal block, the negative directly to the DC- terminal block and ground to the Earth ground terminal block. Moving left to right on each terminal block, each slot is designated for a specific piece of equipment as described below:

- Slots 1-4: In|Sync detection cameras (one per camera)
- Slot 5: SDLC Intercept Module (if necessary)
- Slot 6: In|Sync Processor (pre-wired)
- Slot 7-10: Auxiliary devices that do not need to be remotely power cycled using the DIN Relay.

The panel must be tied to earth ground at the ground terminal block. A power cable connected to the terminal blocks plugs directly into the In|Sync Processor.

The camera's Ethernet cables connect into the lightning arrestors. The processor and exterior network cables are plugged directly into the network switch.

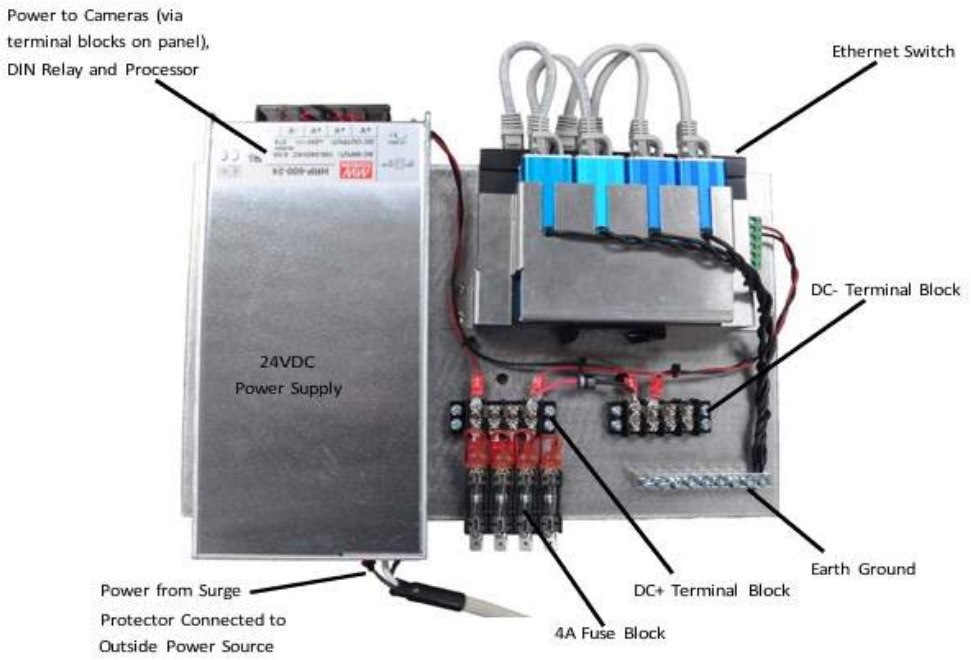


Figure 3-9. Equipment Panel with power and surge protection terminals.

3.2.6. DIN Relay 4



Figure 3-10. DIN Relay

The DIN Relay provides capability to cycle power to In|Sync equipment remotely. The auto-ping feature regularly checks for camera network connectivity by pinging it. If it fails to respond, the DIN relay cycles power to the device once without any manual intervention. Also, the power can be cycled to each camera and processor manually.

3.2.7. SDLC Intercept Module (SIM)

The SIM is Rhythm Engineering's custom serial connection that allows In|Sync to communicate to the Bus Interface Unit (BIU), NEMA TS2, Type 1 controller, and conflict monitor using Synchronous Data Link (SDLC) protocol. It supplies In|Sync with SDLC bus traffic through the cabinet SDLC port.

The TS2 cabinet uses a BIU for converting the SDLC digital signal to a low voltage analog signal that the Traffic Controller uses to primarily drive load switches and field detector inputs. The BIU provides simplification in cabinet wiring as well as flexibility and power.

If the BYPASS switch on the SDLC Intercept Module is engaged, the SDLC Intercept Module directly connects the cabinet and intercept ports for transparent pass-through operation.

> ***Note:*** *The BYPASS switch completely disables In|Sync's ability to communicate through the SDLC bus.*



Figure 3-11. SDLC Intercept Module

3.2.8. Intercept Module (Optional)

The Intercept Module allows In|Sync to accept additional non-standard detection inputs, such as those from pedestrian push buttons or emergency vehicle preemptions (EVP). In The case of pedestrian service, In|Sync temporarily holds the call in a way that minimizes disruptions to In|Sync's progression of vehicles. For Emergency Vehicle Preemption, signals run straight to the controller. In|Sync listens for EVP signals via the Intercept Module to more efficiently recover from the variation in traffic flow created by an EVP event.

See "Installing Pedestrian Interception" for instructions on installing the Intercept Module.



Figure 3-12. Intercept Module

3.2.9. Monitor (Optional)

The monitor allows for accessing the In|Sync Kiosk for full monitoring and configuration of the system while standing at the cabinet. The power button is located on the far-left. It is recommended that you turn it off when not in use. If no image appears, press the PC/AV button once or twice until “PC Input” appears on the screen.



Figure 3-13. Monitor (optional)

3.2.10. USB Keybord (Optional)

A standard USB keyboard with an integrated track ball mouse allows for full control of the In|Sync system through the In|Sync Kiosk. The buttons in the upper-left replace the left and right mouse buttons.



Figure 3-14. Standard USB keyboard (optional)

Chapter 4. Installing the Hardware

Before installing an In|Sync system, verify that the following steps have been completed:

- If the intersection is new, verify that stop bars and lane lines/striping are painted or are clearly identified with markers or cones.
- Power is provided at the traffic cabinet. A generator is acceptable for new construction.
- A controller is installed and functional.
- Camera mounting hardware is assembled and in place at each camera location.
- Specified camera power and CAT6 Shielded, Burial rated Ethernet cables are pulled to each camera location from the traffic cabinet.
- Each camera power and CAT6 Shielded, Burial rated Ethernet cable is clearly marked and identifies its position at the cabinet (NB, SB, EB, WB).
    - » Blue - North Bound
    - » Red - South Bound
    - » Yellow - East Bound
    - » Orange - West Bound
- All In|Sync system components are on-site and inventoried.
    - » Processor
    - » Cameras/enclosures (per plans)
    - » Equipment panel
    - » SDLC Interface Module and associated cabling
- Communications are in place and have been tested:
    - » Between each signal/system (via copper, fiber, or wireless)
    - » Remotely to Rhythm's tech team via VPN or other external network access

4.1. Installing In|Sync Video Detection Cameras

When selecting a location for installing video detection cameras, choose a site that maximizes detection accuracy. Optimal mounting locations should:

- Provide a stable, unobstructed view of each traffic lane on the intersection approach
- Include the stop line and extend back along the approach for a distance equal to that needed for the desired detection layout
- For a mast arm applications:
- Locate the camera in the center of the oncoming approaches with a direct view
- Tilt the camera down and zoomed in to have an image with no view of the horizon
- Place the camera as high as possible.
- Split the through and left turn phases, if possible (see Figure 4 - 2 on page 39).
- For luminaire applications:
- The height of a luminaire arm often provides an excellent camera view.
- The luminaire mounting brackets can be strapped to the luminaire's arm with stainless steel banding, or with screws, or both.
- For corner post or span wire applications:
- Cameras can be mounted directly to the supporting corner poles at span wire intersections.
- Extra care must be taken in selecting the mounting location due to the angle, the wires and signal heads that could obscure the view and complications caused by power lines.
- Typically the camera will be mounted on one of the two poles opposite the approach.
- Sometimes an additional extension arm is required to overcome vehicle occlusion and obtain an acceptable camera view.

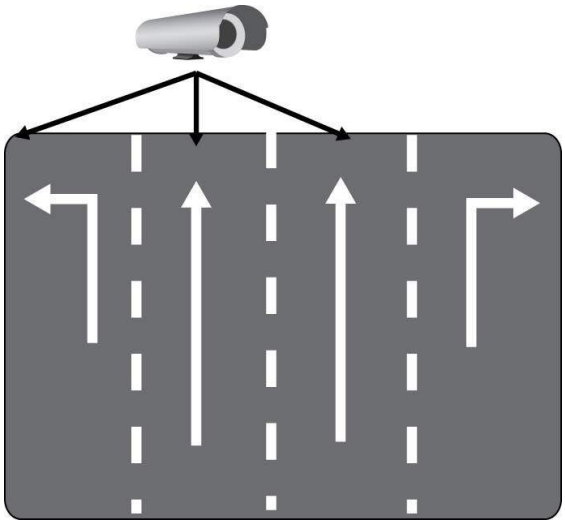


Figure 4-1. Ideal camera placement for detecting one phase on an approach

> ***Note:*** *If a camera is being used to detect more than one vehicle phase, place the camera in a location between the phases (see Figure 4 - 2).*

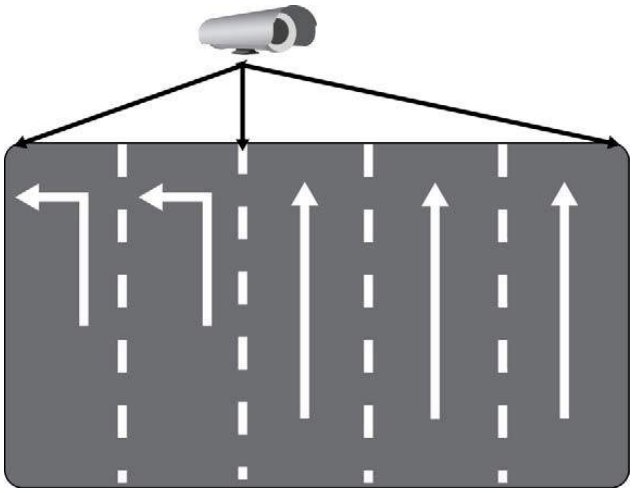


Figure 4-2. Ideal camera placement for camera detecting two phases (left turn and through lanes)

4.1.1. Pull power and Ethernet cabling

> ***Note:*** *Rhythm Engineering recommends using Commscope P/N: 8841405/10 2003 Black ICAT5E cable (or Rhythm-approved equivalent CAT6 Shielded, Burial rated outdoor UV-resistant aerial/duct Ethernet cable).*

If you are installing the camera in temperatures under 0° C/32° F, we recommend using the Belden 7937A Multi-Conductor - DataTuff® Waterblocked CAT6 Shielded, Burial rated Cable because it remains flexible in temperatures up to -25°C/-13°F.

1. Pull the Ethernet cabling from the traffic cabinet to the specified camera location. We recommend that you leave 10 ft. of slack at the cabinet and 5 ft. of slack at each camera.
2. In addition to pulling the Ethernet cable from the traffic cabinet, you also need to pull the power cable to the cameras/enclosures. Rhythm Engineering recommends using IMSA 20-1 traffic control cable (14-3 AWG stranded copper).

4.1.2. Install mounting hardware and mount cameras

Refer to the user documentation provided with the mounting hardware for instructions on installing the mounting hardware and mounting the cameras.

> ***Note:*** *Avoid fully locking the camera angle into a direction prior to confirming camera angle and view with the technician on the ground.*

4.1.3. Terminate power and Ethernet connections at the camera location

> ***Note:*** *If cabling is connected to the camera before being tested, warranty is null and void.*

Terminate Ethernet connections

1. Remove the external portion of the fitting by unscrewing the sealing nut and turning the coupling ring counter-clockwise.

2. Slide the CAT6 Shielded, Burial rated cable through the sealing nut, coupling ring and plug holder (see Figure 4 - 3.) To slide the cable through the plug holder, twist the cable while pushing it through.



Figure 4-3. Ethernet threaded through plug holder, coupling ring and sealing nut

3. Strip off approximately 2" of outer cable jacket as shown.

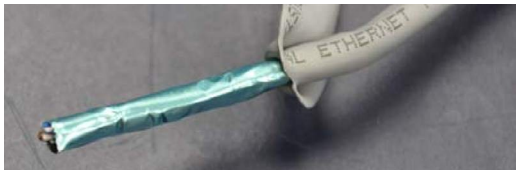


Figure 4-4. Stripped cable jacket

4. Keeping the foil intact, trim/cut foil, leaving ½" to " of foil.

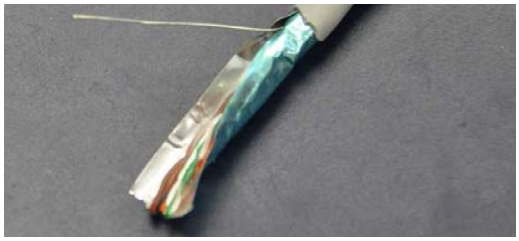


Figure 4-5. Trim foil and separate drain wire

5. Fold the outer casing back over the cable jacket.
6. Pull drain wire down and away from the conductors and wrap/coil tightly around the foil.

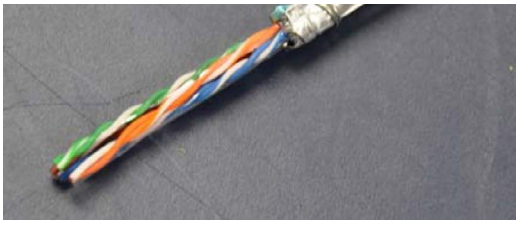


Figure 4-6. FIGURE 4 - 6. Foil folded back and drain wire coiled around foil

7. Straighten wires, separate pairs and put them in the desired order. See wiring chart B on the crimp tool for the correct wire color sequence.

8. Trim wire ends so all the conductors are equal length.

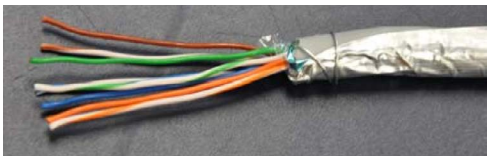


Figure 4-7. Separated wires

9. Insert wires into the connector and pull the connector down over the cable jacket. The cable jacket should sit snugly to the rear of connector.

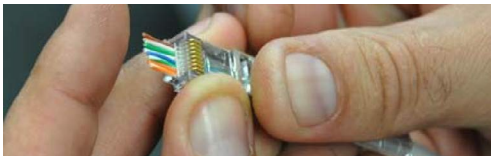


Figure 4-8. Push wires into the connector

> ***Note:*** *You may need to use pliers to pull the wires through the connector so that the cable jacket is completely encased in the connector.*



Figure 4-9. Pull the wires using pliers to ensure the cable jacket is fully inserted into the connector

10. Double-check the wiring sequence (orange stripe, orange, green stripe, blue, blue stripe, green, brown stripe and brown) and make sure the foil and drain are positioned on the grounding platform of the connector.

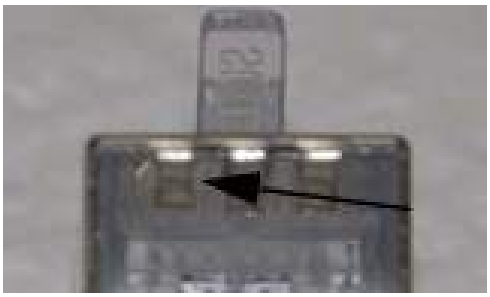


Figure 4-10. Verify that the foil and drain are positioned on the grounding platform

11. Push the EZ-RJ45 connector into the EZ-RJ45 Crimp tool. Make sure the connector is fully seated in the crimp cavity.



Figure 4-11. Crimping tools

12. Actuate the EZ-RJ45 crimp tool to secure the connector and trim wires. Break off any remaining loose wires.

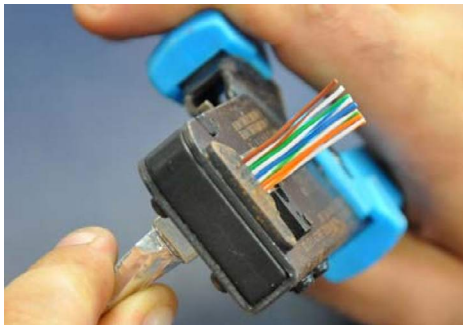


Figure 4-12. Crimping the connector using the EZ-RJ45 crimp tool

13. Pull the Ethernet cable so that the EZ-RJ45 plug is seated within the plug holder.

14. Slide the coupling ring up the wire. Turn it clockwise to attach it to the plug holder.

15. Slide the sealing nut up the wire and screw it to the plug holder.



Figure 4-13. Finished Ethernet connector

16. Connect the EZ-RJ45 plug into the enclosure's connector. Screw the coupling ring to secure the connection to the camera enclosure.

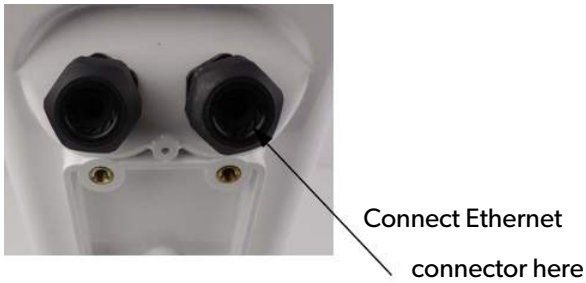


Figure 4-14. Location for Ethernet camera connection

Terminate Power Connections

You must terminate the power cable in order to connect power to the camera enclosure. To terminate the power cables:

1. Assemble the nut, washer, bushing and plug together.

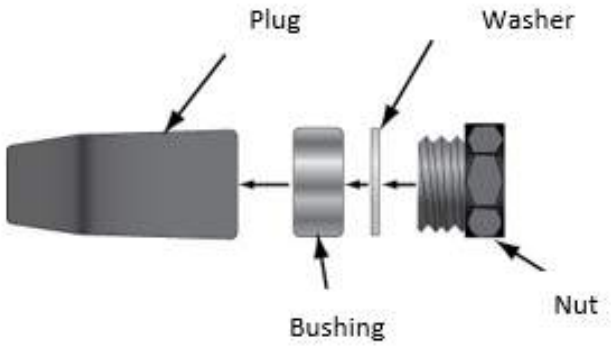


Figure 4-15. Power cable installation

2. Thread the power cable through the assembled housing from step 1.

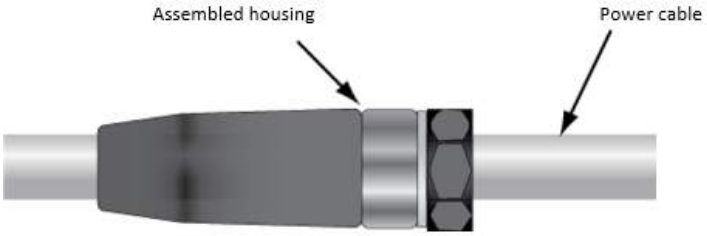


Figure 4-16. Threading the power cable through the assembled housing

3. Strip 1/2" of jacket off the power cable.
4. Strip 3/8" from the individual wires.
5. Slide the stripped wires through the harness and attach the bracket with the two provided crews. Do not tighten.

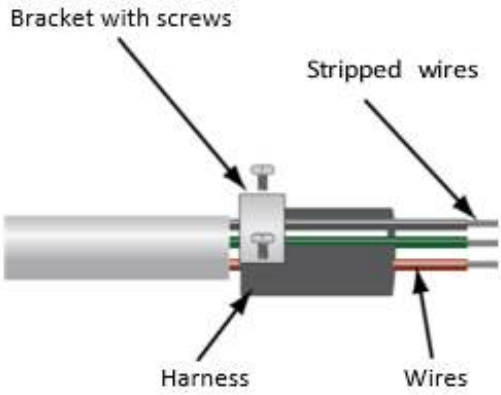


Figure 4-17. Inserting the stripped wires through the harness

6. Insert the stripped wires into the connector plug as shown in Figure 4 - 18.

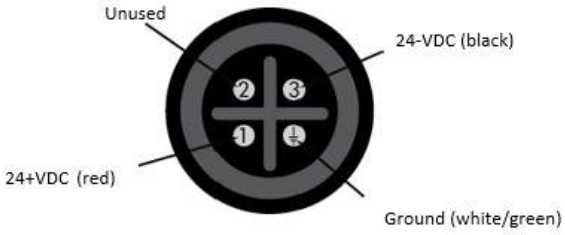


Figure 4-18. Connector plug wiring configuration

7. Tighten the screws on the side of the plug to secure the wires.

FIGURE 4 - 19. *Screw locations*



Figure 4-19. Screw locations

8. Slide the harness into the connector plug. Tighten the screws on the bracket.

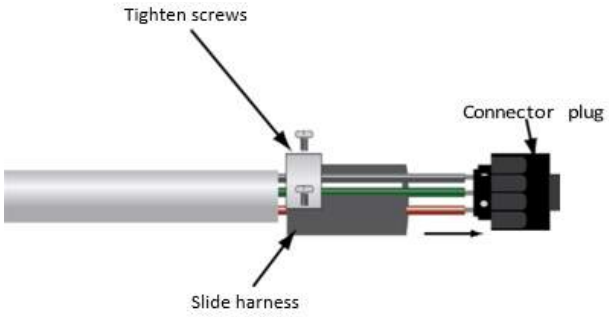


Figure 4-20. Slide harness to connector and tighten screws

9. Slide the plug that was assembled in step 1 along the cable into the connector plug.

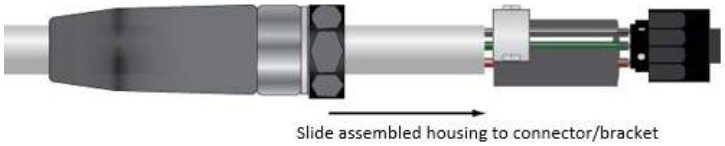


Figure 4-21. Connect the assembled housing to the connector plug

10. Connect the terminated power cable to the connector plug located on the camera enclosure.

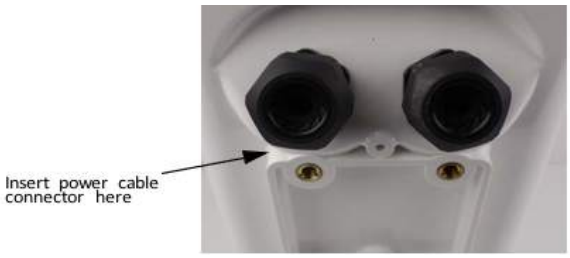


Figure 4-22. Location for connecting power

11. Tighten the nut around the power cable to prevent slipping.

4.2. Connect the Equipment Panel

4.2.1. Secure the equipment panel

Install and secure the equipment panel inside the cabinet using either a rack-mount in a 330s-style cabinet or to the side wall "C" channel using spring clips in a NEMA cabinet. Ensure the camera power cable reaches the required termination points when deciding where to install. Keep in mind ease of access to equipment/back panel, which may be located behind the equipment panel.

Using a 18-22 AWG wire, attach two spade connectors to each end. Connect one end to the DC- terminal on the equipment panel. Connect the other end to the same LG (Logic Ground, Logic Common) reference that In|Sync is using via the .

4.2.2. Secure the DIN Relay

After installing the equipment panel, secure the DIN Relay inside the cabinet using a DIN rail. It can be rack-mounted in a 330s-style cabinet or to the side wall "C" channel using spring clips in a NEMA cabinet. Place the DIN in a convenient location for wire management, again considering access to other equipment in the cabinet.

Connect Camera Power To The Equipment Panel

The 24 VDC power supply that provides power to the Ethernet switch, processor, DIN Relay and cameras is located on the left side of the equipment panel when mounted in the orientation pictured in Figure 4 - 25 on page 51. The IMSA 20-1 power cable specified for In|Sync is a 3 conductor cable that is color coded red, black and white. We use red for positive, black for negative and white marked with green electrical tape for ground.

> ***Note:*** *If your wires are not red, black and white, note the correct colors for DC+, DC- and ground. Connect those wires into the appropriate locations on the equipment panel and DIN Relay.*

The equipment panel has three points of power termination for the cameras:

- DC+ in the form of (4) 4-amp fuse blocks for the cameras (i.e., four-camera system) and a terminal strip
- DC- in the form of a terminal strip
- Earth ground bar

The DIN Relay has eight relay switches capable of switching power, each consisting of three termination points: NC (normally closed), NO (normally open) and COM (field wire).

Rhythm feeds the DC+ from the equipment panel for each camera through the DIN Relay switch. This allows power to be cycled to the cameras remotely.

To connect a camera to the equipment panel via the DIN Relay using 16-18 AWG insulated copper conductor wire:

1. If jumpers between the 4A fuse block and DC+ terminal exist on the equipment panel, remove them.
2. Connect the camera's DC+ to the bottom connector on the equipment panel's 4A fuse block.
3. Using a 16-18 AWG insulated copper conductor wire, connect the DIN Relay's COM terminal to the corresponding top connector on the equipment panel's 4A fuse block.

   Sequence: 1 - NB, 2 - SB, 3 - EB, 4 - WB

4. Connect the corresponding equipment panel's DC+ terminal to the corresponding DIN Relay's NC terminal.
5. Tie each camera's dedicated DC- and Earth ground directly to the equipment panel.
    a. Tie the black negative (DC -) leads into a terminal strip (center) using spade connectors.
    b. Tie the white ground leads directly to the ground bar in the lower right of the panel.

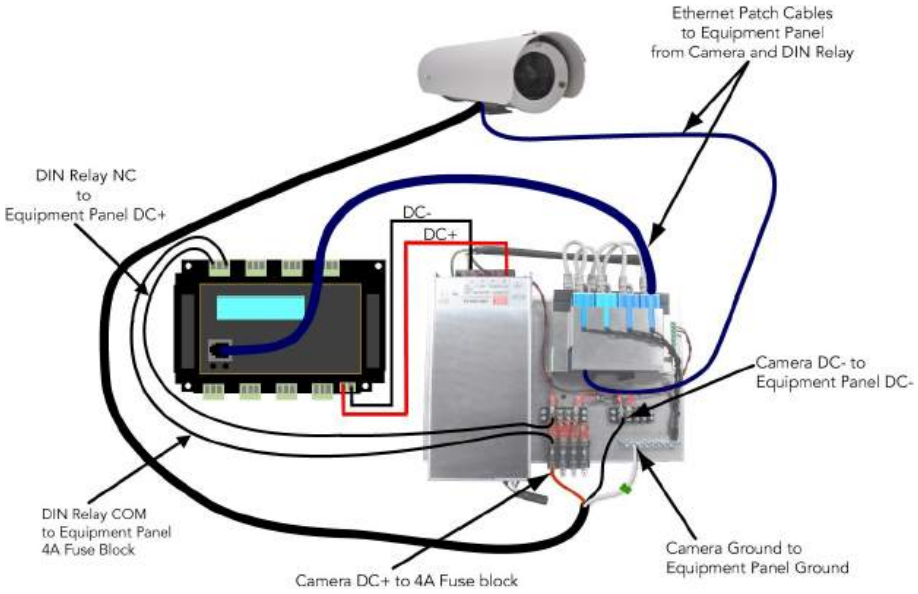


Figure 4-23. Complete wiring between the camera, DIN relay and equipment panel

Install the DIN Relay

Prior to installing the DIN Relay 4, ensure that the following equipment has been installed and is ready for operation:

- In|Sync Processor
- In|Sync Equipment Panel with Power Supply and Network Switch
- In|Sync Cameras

A cable harness is constructed to take the DC+ from the terminal block to the DIN NC terminal and from the DIN common back to the equipment panel quick connect on the inner side of the fuse block. The panel must be tied to earth ground at the ground bar. In addition, the DIN Relay cable harness connects the processor's DC+ to the equipment panel through the DIN Relay.

The camera's Ethernet cables connect at the bottom of the lightning arrestors. The processor and exterior network cables are plugged directly into the top of the network switch.

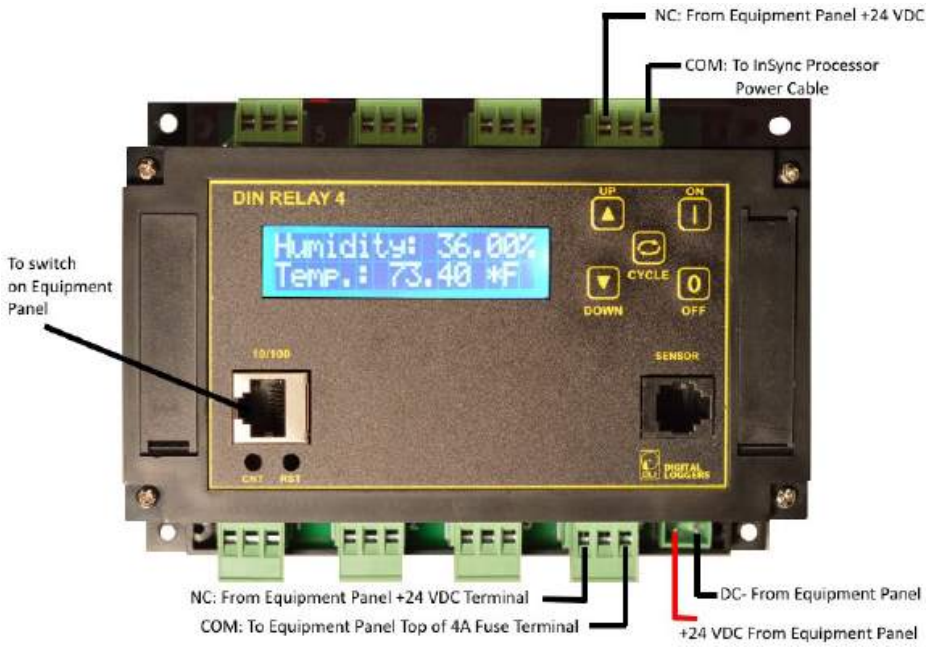


Figure 4-24. I/O communication ports on the DIN Relay

Mounting, Power, and Ethernet to DIN Relay

1. Install a standard section of DIN rail into the traffic cabinet. Attach the DIN Relay to the DIN rail securely.
2. Use a 2 conductor (16-18 AWG) insulated copper wire to connect the DIN Relay power input directly to the Equipment Panel power supply. Ensure that the polarity is correct by referring to the labels on the devices.
3. Connect an Ethernet patch cable from the DIN relay's 10/100 port directly to the network switch on the Equipment Panel.

Camera Connections

1. Using a pre-built wiring harness with 16-18 AWG insulated copper wire, connect a wire from the +24 VDC terminal block to one of the NC terminals of one of the relay connections on the DIN Relay. Connect a corresponding wire back from the COM terminal of the same relay

connection to the top of one of the 4 A fuse blocks, leaving the bottom of the fuse block open.

2. Connect the bottom of the 4 A fuse block to one of the camera +24 VDC power cables. Connect the negative wire of the camera power cable to the DC- terminal block on the Equipment Panel.
3. Repeat steps 1 and 2 for the remaining cameras.

Supply Power to the DIN Relay

To supply power to the DIN Relay, use 2 (16-18 AWG) insulated copper conductors to connect directly from the LOAD side of the 24V/DC power supply to the terminals on the DIN Relay labeled 8-24V AC/DC POWER IN (+/+, -/-).

1. Connect the processor power cable +24 VDC wire to the COM terminal of relay 8 on the DIN Relay.
2. Connect a 16-18 AWG insulated copper wire from the NC terminal of relay 8 on the DIN Relay back to the +24 VDC terminal of the power supply on the Equipment Panel.
3. Connect the DC-/Gnd wire of the In|Sync processor power cable directly to the DC- terminal of the power supply on the Equipment Panel.

Connect Ethernet to The DIN Relay

The following diagram shows how the In|Sync cameras and DIN Relay terminals are connected to the Equipment Panel. Use an Ethernet patch cable to connect the DIN Relay switch to the equipment panel's Ethernet switch.

Connect Camera Ethernet Cables

After terminating Ethernet cables with RJ45 connectors, (see earlier instructions on how to terminate Ethernet connections), plug each camera's Ethernet cable directly into the bottom of the lightning arrestors. The exact order of these plugs isn't important for system operation, but for consistency we typically order our terminations from left to right:

- North Bound, South Bound, East Bound, West Bound

4.3. Installing In|Sync:Thermal Detection Cameras

The In|Sync:Thermal camera requires a power connection and a video connection, both of which enter the camera via a single cable gland on the back of the camera. The following directions guide you in the installation of In|Sync:Thermal cameras.

> ***Note:*** *For more detailed instructions regarding the installation of the In|Sync:Thermal camera, see the FLIR FC Series Installation manual.*

4.3.1. Wire the camera enclosure

Follow the directions in Sections 1.4 –1.7 in the FLIR FC Series Installation manual to wire the camera for power and Ethernet connections.

4.3.2. Mount the camera

When selecting a location for installing thermal detection cameras, choose a site that maximizes detection accuracy. Optimal mounting locations should:

- Provide a stable, unobstructed view of each traffic lane on the intersection approach
- Be positioned for optimal viewing of the see stop bar and queue
- Include the stop line and extend back along the approach for a distance equal to that needed for the desired detection layout
- Reduce the amount of the horizon to allow for a stronger contrast of the captured frame
- Installing In|Sync:Thermal Detection Cameras

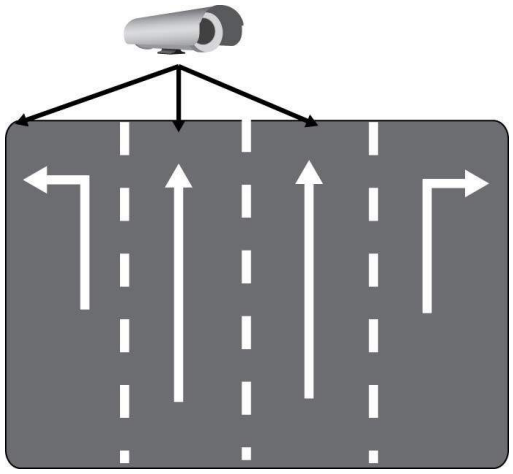


Figure 4-25. Ideal camera placement for detecting one phase on an approach

> ***Note:*** *If a camera is being used to detect more than one vehicle phase, place the camera in a location between the phases.*

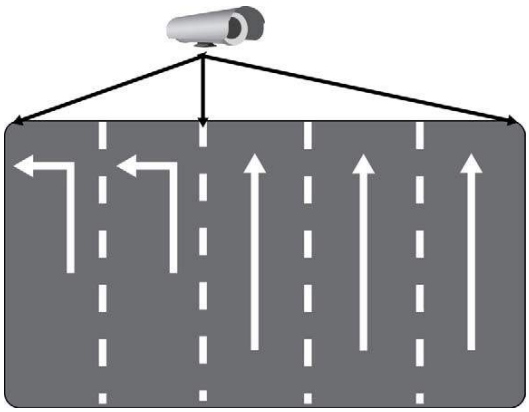


Figure 4-26. Ideal camera placement for camera detecting two phases (left turn and through lanes)

4.3.3. Pull cabling

> ***Note:*** *Rhythm Engineering recommends using Commscope P/N: 8841405/10 2003 Black CAT6 Shielded, Burial rated cable (or Rhythm-approved equivalent CAT6 Shielded, Burial rated outdoor UV-resistant aerial/duct Ethernet cable).*

If you are installing the camera in temperatures under 0° C/32° F, we recommend using the Belden 7937A Multi-Conductor - DataTuff® Waterblocked CAT6 Shielded, Burial rated cable because it remains flexible in temperatures up to -25°C/-13°F.

Pull the Ethernet cabling from the traffic cabinet to the specified camera location. We recommend that you leave 10 ft. of slack at the cabinet and 5 ft. of slack at each camera.

4.3.4. Install mounting hardware and mount cameras

Refer to the user documentation provided with the mounting hardware for instructions on installing the mounting hardware and mounting the cameras.

> ***Note:*** *Avoid fully locking the camera angle into a direction prior to confirming camera angle and view with the technician on the ground.*

4.4. Grounding the In|Sync System

Install Ground wire between the Insync equipment panel grounding bar and the cabinet's ground bus. Install a 14 gauge grounding wire going from the Rhythm equipment panel ground bar to a ground bus inside the cabinet that is bonded to earth ground.

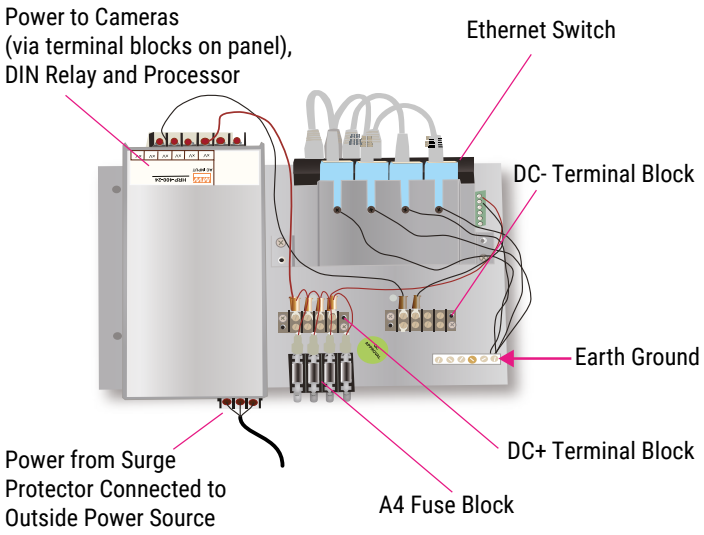


Figure 4-27. Grounding the system

4.5. Connecting the Processor

4.5.1. Secure the Processor in the Traffic Cabinet

The processor can be rack-mounted using rack-mount brackets in a 330s cabinet placed on any unused shelf space in a NEMA cabinet. Pay attention to power availability and cabling needs when deciding a location for installing the processor.

Once the processor is in place, you can connect it to other components in the cabinet.

4.5.2. Connect power to the processor

The equipment panel's 24 VDC power supply also provides power to the In|Sync Processor. In order to remotely cycle power to the processor, the processor's DC+ is fed through the DIN Relay using a provided DIN Relay cable harness. To connect power to the processor:

1. Remove the processor's spade connector (black wire) from the power supply DC+ terminal.
2. Cut the spade connector from the black wire and strip 1/3" of insulation from the end.
3. Crimp the black wire into the DIN Relay cable harness barrel connector.
4. Connect the processor's DC- spade connector to the power supply's DC- terminal.
5. Attach the spade connector on the cable harness's black wire to DIN Relay 8, COM terminal.

6. Attach the spade connector on the cable harness's white wire to DIN Relay 8, NC terminal.
7. Attach the spade connector on the other end of the cable harness's white wire to DC+ on the equipment panel's power supply.

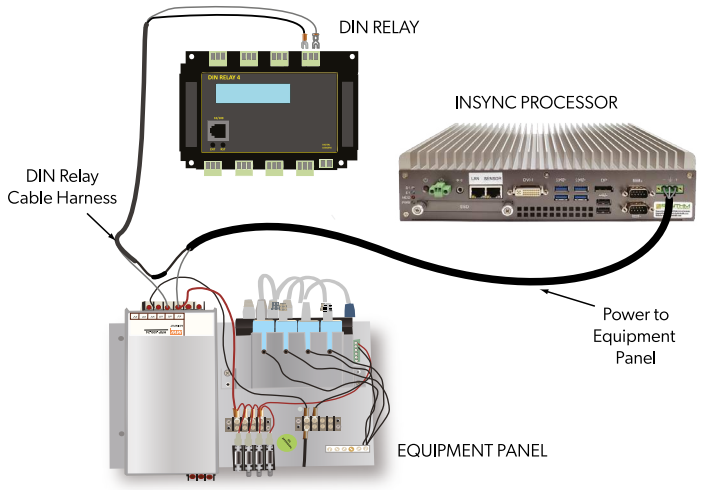


Figure 4-28. Completed power wiring between the equipment panel and processor

4.5.3. Connect the processor to the Ethernet switch

Use a supplied Ethernet patch cable (3' or 7' as needed) to connect the Ethernet port on the front of the processor to an empty port on the equipment panel's Ethernet switch.

4.5.4. Connect the panel to outside power

After camera power and Ethernet terminations are made, plug the DC power supply into the provided surge protector power strip. Then, plug the surge protector into a standard 110V grounded receptacle inside the cabinet. Make sure the outlet is not a Ground Fault interrupter.

4.5.5. Install the video monitor/keyboard (optional)

If the keyboard/monitor option was purchased, the monitor may be mounted as well. Install the 10" monitor using the provided mount as close to eye level as possible, taking care to avoid locations where equipment and/or cabinet door will be obstructed. Connect the power supply included with the monitor to an available outlet. Connect the VGA cable to the video port on the front of the processor.

The keyboard uses a simple USB connector. Keyboards can be plugged or unplugged at any time and are commonly unplugged when not in use and stored on a shelf or hung in a bag on the cabinet door.

4.6. Validating Connections

Verify that the processor is labeled with the correct IP address and that all Ethernet cables are fully connected. Also, make sure to set the Mode switch on the processor to Adaptive, even if you are running in Detector mode.

> ***Note:*** *At this point, since no configurations exist for the corridor, the In|Sync software automatically runs in Detector mode even though the switch on the processor is set to Adaptive. In|Sync will not run Adaptive mode until Adaptive mode is turned on in the software and configurations for the corridors exist.*

Test the CAT6 Shielded cable run with Fluke Micro Scanner or similar device - required data shown on tester is Length, Resistance, Frequency, and Insertion Loss Margin.

4.6.1. Troubleshoot an improperly operating camera

If the camera is not receiving power, check to make sure the camera power cables are terminated correctly and verify that there is 24 VDC output from the equipment panel (fuse may need to be replaced).

An improperly crimped Ethernet cable prevents proper communications and makes the camera invisible on the network.

If a problem persists after re-crimping both ends of the Ethernet cable and confirming crimping/ cable integrity and that the camera is receiving 24 VDC, test a new camera in the same location.

(See page 55 for more information).

Chapter 5. Connecting a Laptop

5.1. Configuring a Laptop to Access the network

After connecting all the In|Sync hardware to the existing equipment in the cabinet, you can use a laptop to access the processor and cameras for final intersection configuration. This is done by connecting the laptop's Ethernet port directly to the network switch on the equipment panel. In order for this to work properly, you must configure your laptop's Ethernet network connection to use the static IP address that is compatible with the network settings assigned to the In|Sync system. To configure your laptop to use the processor's network's static IP address:

5.1.1. For Windows XP

> ***Note:*** *Before adding an IP, close network programs and browsers.*

1. Click the Start button and go to Control Panel.
2. Double-click Network Connections.
3. Right-click on the appropriate connection (typically called "Local Area Connection"). Select Properties

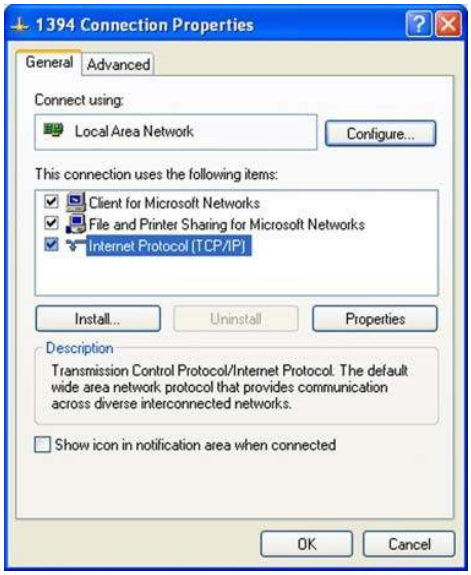


Figure 5-1. Properties dialog box

4. Scroll down and select **Internet Protocol (TCP/IP)** from the Properties dialog box. Click the **Properties** button.
5. Select **Use the following IP Address** and assign the IP address settings to be compatible with that of the local system:

   IP address: Assign an IP address that does not conflict with any device on the network

   Subnet mask: Match the current subnet assigned to the processor.

   Gateway address: Match the current gateway assigned to the processor.

   For instance, if the In|Sync Processor's IP address is 192.168.0.150, the subnet mask is 255.255.255.0 and the gateway is 192.168.0.1, set your IP to 192.168.0.X (where X is the free IP), subnet mask to 255.255.255.0 and gateway to 192.168.0.1.

6. Click **OK**, then **OK** again to apply the changes.

Once attached to the network, verify the connection is working by opening a web browser and visiting the web address associated with the In|Sync Processor (e.g. http://192.168.X.XXX).

5.1.2. For Windows 7/Windows Vista

> ***Note:*** *Before adding an IP address, close network programs and browsers.*

1. Click the **Start** button and go to **Control Panel**.
2. If you are using the Windows Vista OS, click **Classic View** from the left panel.
3. Double-click **Network** and **Sharing Center**.
4. For Windows 7, click **View Network Status and Tasks** from the main panel, then click **Change adapter settings** from the left panel.

   For Windows Vista, click **Manage network connections** from the left panel.

5. Right-click the appropriate connection (typically called "Local Area Connection"). Select **Properties** from the shortcut menu.
6. Scroll down and select **Internet Protocol Version 4 (TCP/IPv4)**.

7. Click the **Properties** button.

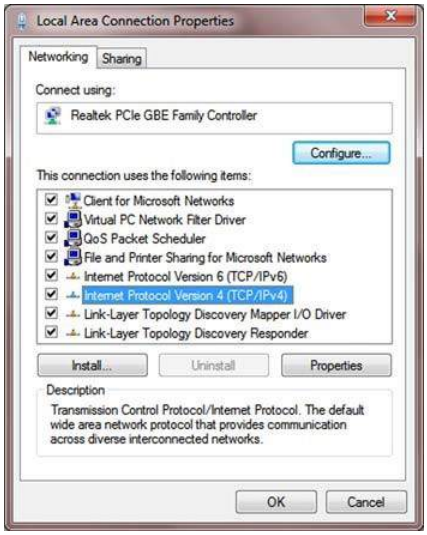


Figure 5-2. Local Area Connection Properties dialog box

> ***Note:*** *You may receive a message stating that Windows needs your permission to continue. Click* ***Continue****.*

8. Select **Use the following IP Address** and assign the IP address settings to be compatible with that of the local system:

   IP address: Assign an IP address that does not conflict with any device on the network.

   Subnet mask: Match the current subnet assigned to the processor.

   Gateway address: Match the current gateway assigned to the processor.

   For instance, if the In|Sync Processor's IP address is 192.168.0.150, the subnet mask is 255.255.255.0 and the gateway is 192.168.0.1, set your IP to 192.168.0.X (where X is the free IP), subnet mask to 255.255.255.0 and gateway to 192.168.0.1.

9. Click **OK**, then **Close** to apply the changes.

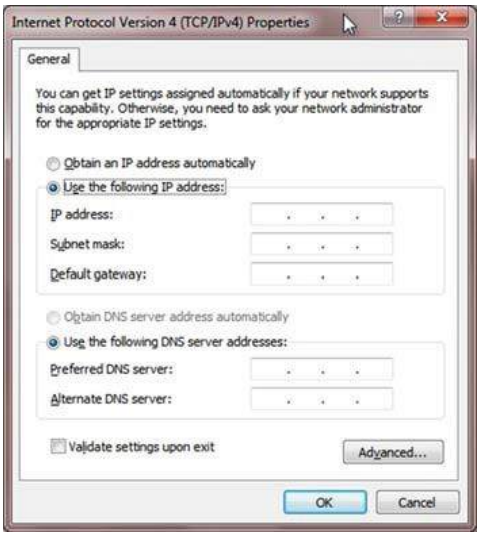


Figure 5-3. TCP/IPv4 Properties dialog box

5.1.3. For Windows 8 / Windows 10

Note: *Before adding an IP address, close network programs and browsers.*

1. To begin configuring your Windows 8 computer for the network, select the **Desktop** tile from the Start screen. This displays the Desktop view.
2. Click the **Start** icon on the bottom left corner of the screen. The Start menu displays.
3. Click **Control Panel** in the Start menu. The Control Panel dialog box displays.
4. Click **Network and Internet**.
5. Click **Network and Sharing Center**.
6. Click **Change adapter settings** from the left panel.
7. Right-click the appropriate connection (typically called "Ethernet"). Select **Properties** from the shortcut menu. The User Account Control dialog box displays.
8. Type in the administrator's password and click **OK**. The Ethernet Properties dialog box displays.
9. Scroll down and select **Internet Protocol Version 4 (TCP/IPv4)**.
10. Click the **Properties** button.

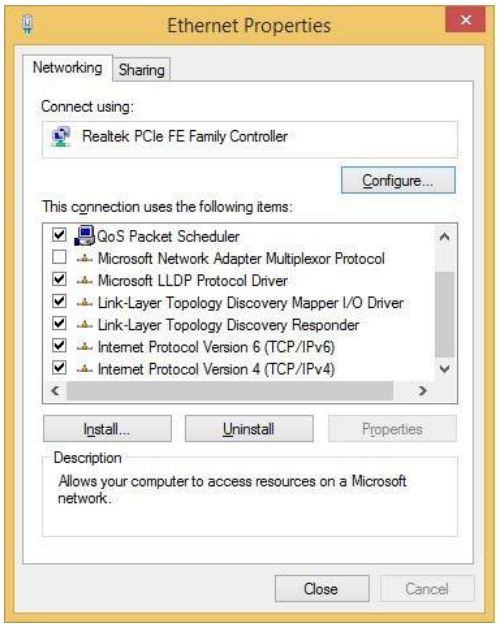


Figure 5-4. Ethernet Properties dialog box

11. Select **Use the following IP Address** and assign the IP address settings to be compatible with that of the local system:

    IP address: Assign an IP address that does not conflict with any device on the network.

    Subnet mask: Match the current subnet assigned to the processor.

    Gateway address: Match the current gateway assigned to the processor.

    For instance, if the In|Sync Processor's IP address is 192.168.0.150, the subnet mask is 255.255.255.0 and the gateway is 192.168.0.1, set your IP to 192.168.0.X (where X is the free IP), subnet mask to 255.255.255.0 and gateway to 192.168.0.1.

12. Click **OK** to save the changes and go to the Ethernet Properties dialog box.

13. Click **Close** to close the Ethernet Properties dialog box.

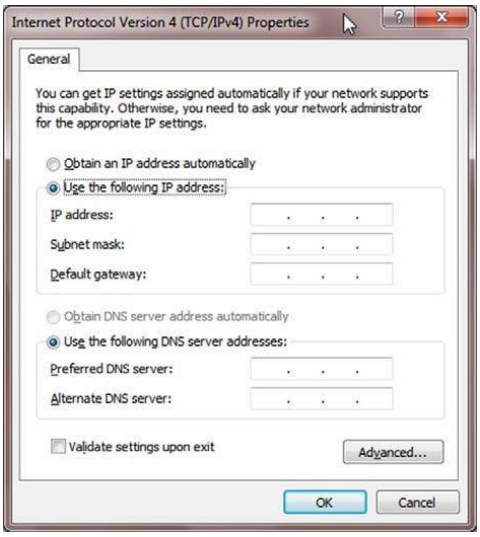
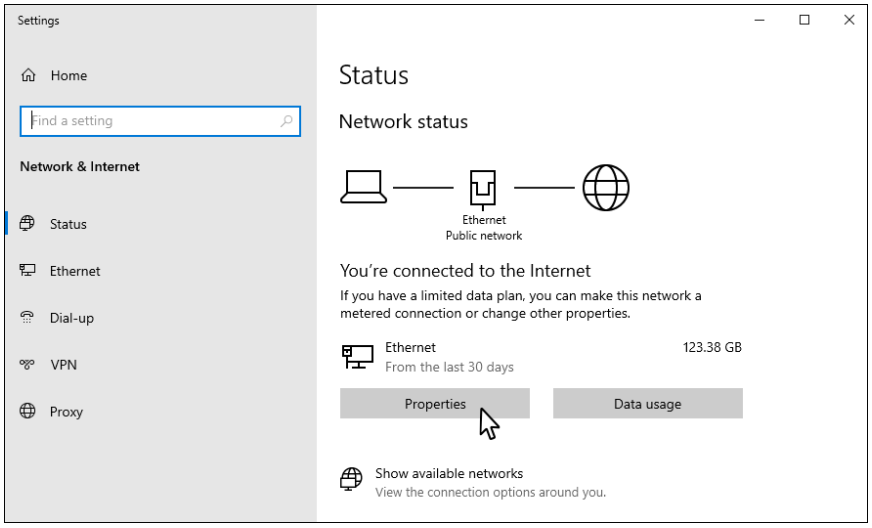


Figure 5-5. TCP/IPv4 Properties dialog box

5.1.4. For Windows 11

1. Right click bottom right **symbol for network**.
2. Click **network and internet settings**.
3. Click **properties under ethernet** and **change the IP accordingly.**



Chapter 6. Adjusting the In|Sync Detection Cameras

6.1. Zooming/Focusing In|Sync Visible Detection Cameras

This section discusses using the CameraIO utility on the In|Sync Kiosk to zoom and focus the camera at each intersection. Some models of Insync Optical cameras allow for remote zoom and focus such as the Optical + models.

To zoom and focus the cameras:

1. Within the In|Sync Kiosk. select the **Advanced** Tab.
2. Click the **Camera IO** button to access the CameraIO application. A CameraIO application for each camera displays.

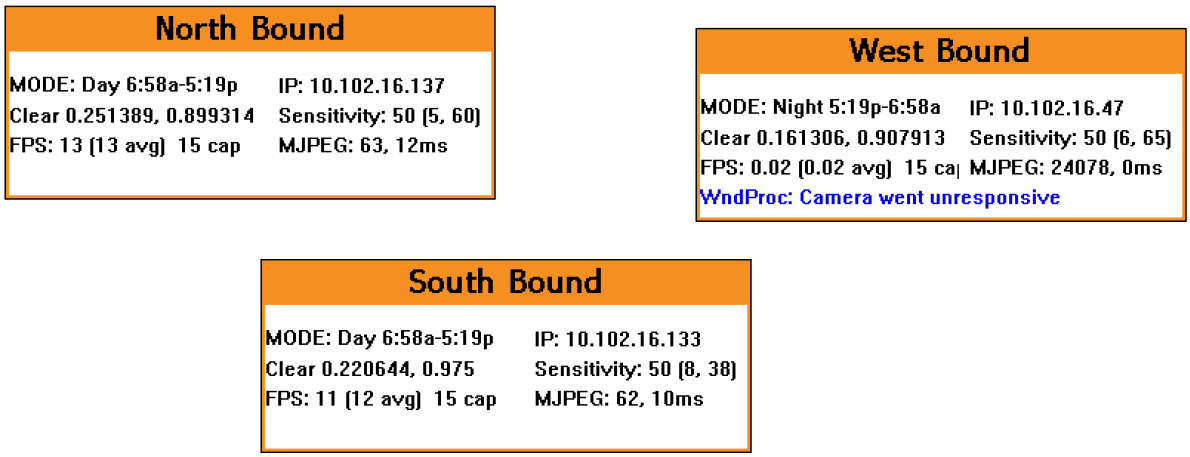


Figure 6-1. Camera IO applications for each camera at an intersection

3. Click on the Camera IO direction that you want to adjust.
4. Press [Ctrl] and [Z] to display the Zoom and Focus controls.



Camera focus and zoom controls using the CameraIO

5. Adjust the zoom and focus controls by clicking either the + or – buttons to achieve the correct level of zoom and focus.
6. Click **Save** to save the Zoom and Focus settings.

Camera adjustment tips

- Avoid including the horizon in the camera view.
- Target the camera so that queue count is maximized.
- Target the camera to maximize the area of detection.
- Avoid sun glare by tilting cameras down as much as possible while still including the queue count minimum needed for In|Sync adaptive control.

> ***Note:*** *East-bound and west-bound cameras are especially sensitive to sun glare during sunrise and sunset.*

- Include right and left turn stop bar detection, as well as the space in front where cars are likely to pull ahead of the stop bar

> ***Note:*** *Always include right-turn only stop bar detection if needed due to laws/policies in your area.*

Some vehicles cannot turn right except for on a green light (i.e., school buses); these vehicles need to be detected.

For dedicated right turn lanes exiting off the mainline onto smaller side streets, you may want to maximize the camera view on the through and left turn lanes and disregard the dedicated right turns. You may also want to disregard dedicated right turns on crossing arterials if they have dedicated slip lanes. This maximizes the camera view on the target area of detection and will improve the In|Sync video detection performance.

6.2. Aligning the In|Sync:Thermal Detection Cameras

This section discusses using a browser to align the camera at each intersection. These steps are best performed using a laptop connected to the Ethernet switch on the equipment panel.

To ensure proper alignment of the In|Sync:Thermal cameras:

1. From your computer, launch an Internet browser. We strongly recommend using Google Chrome or Mozilla Firefox. Do NOT use Internet Explorer.
2. Type the IP address of the camera in the address bar.

   For example, IP address (IPv4): 192.168.1.100 = http://192.168.1.100

   The Login dialog box appears.
3. Type user in the **User Name** field.
4. Enter password in the **Password** field.
5. Click **Log in**. The Live Video page displays with a live image from the camera on the left part of the screen.
6. Work with the installer in the bucket truck to position the camera so that vehicles within the captured lanes can be easily distinguishable.
7. Once the camera is correctly positioned, lock the camera position into place.
8. Click **Log Out** to close the FLIR Live Video page.

> ***Note:*** *For more information regarding FLIR camera installation, see the FLIR FC Series S Installation Manual.*

Camera adjustment tips

- Include some of the horizon in the camera view. Because a thermal camera relies on temperature differences between objects, including a little of the horizon generally allows the camera to produce high-contrast imagery.
- Target the camera so that queue count is maximized.
- Target the camera to maximize the area of detection.
- Include right and left turn stop bar detection, as well as the space in front where cars are likely to pull ahead of the stop bar

> ***Note:*** *Always include right-turn only stop bar detection if needed due to laws/policies in your area.*

Some vehicles cannot turn right except for on a green light (i.e., school buses); these vehicles need to be detected.

For dedicated right turn lanes exiting off the mainline onto smaller side streets, you may want to maximize the camera view on the through and left turn lanes and disregard the dedicated right turns. You may also want to disregard dedicated right turns on crossing arterials if they have dedicated slip lanes. This maximizes the camera view on the target area of detection and will improve the In|Sync video detection performance.

6.3. Confirming Camera Views through the In|Sync Processor

This section discusses using the In|Sync Kiosk on the processor to verify camera views.

> ***Note:*** *We recommend using a monitor and keyboard with trackball to connect to the In|Sync Processor only for confirming proper zoom, focus and camera field-of-view.*

To confirm the camera views through the In|Sync Processor:

1. Connect a monitor and keyboard (with trackball) to the In|Sync Processor.
2. Turn on the monitor. The In|Sync Kiosk displays.

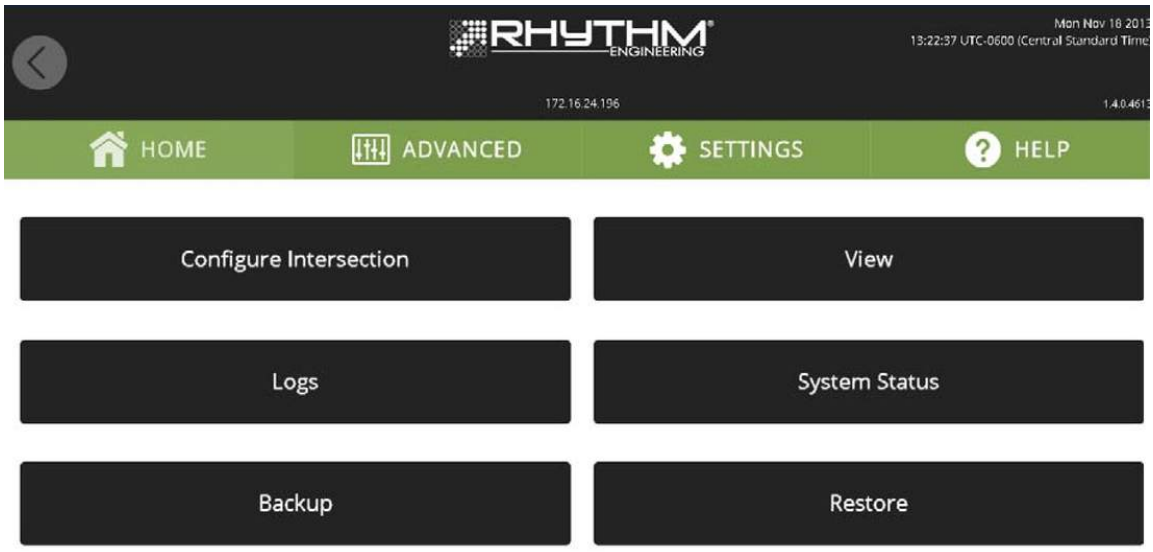


Figure 6-2. The In|Sync Kiosk

3. Click **View** from the Home screen. The Quad Camera screen displays.
4. To view an enlarged view of the camera, click on the camera feed. You can click it again to return to the Quad Camera view. Use this screen to confirm that the camera views are correct.

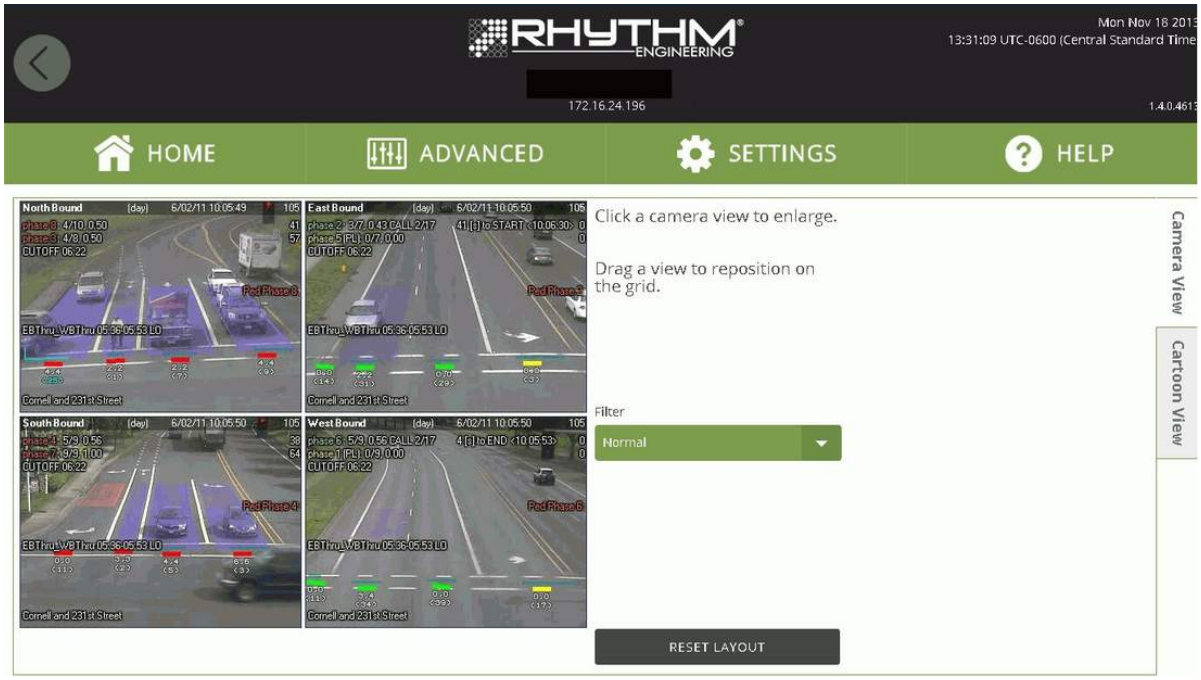


Figure 6-3. Confirming camera views of an intersection within the In|Sync Kiosk

Chapter 7. Configuring In|Sync

7.1. Accessing the In|Sync Processor

1. Plug in the monitor to the In|Sync Processor and turn it on. If no image appears:
    - Verify the VGA cable is plugged into the monitor and processor securely
    - Push the PC/AV button on the monitor to make sure the monitor is reading from the "PC" signal.
2. Plug in any keyboard and mouse, if necessary. USB keyboards and mice can be plugged and unplugged at any time.

7.2. Configuring the Intersection

After connecting all cables to the In|Sync Processor and turning on the In|Sync Processor, there are a number of steps that must be performed:

Configure

1. Confirm camera views through the **View** button.
2. Configure the intersection and detectors using the **Configure Intersection** button.
3. Grab camera backgrounds through the **View** button.
4. Set the network settings through the **Network settings** button.
5. Set the time, date and/or time zone on the In|Sync Processor with the Date/Time button.
6. Set the GPS coordinates of the intersection.
7. Set the NTP server if you are using an NTP server to synchronize time between processors.

Test

8. Verify that inputs are being received (from the detectors if used and Green Returns from the controller) and that outputs are being sent to the controller by manually placing calls from In|Sync and verifying in the controller.

> ***Note:*** *After installing the In|Sync Processor, you should run Detector mode for two weeks to verify that inputs and outputs are being sent properly, to collect sufficient historical data for adaptive operation and to allow enough time for a corridor to be installed. For instance, a 10-intersection corridor may take up to a week to have processors installed at each intersection. The two-week time period allows for enough time to get all intersections installed, running and tested with the In|Sync Processor.*

7.3. Configuring Detectors from the Processor

Clicking **Configure Detectors** from the Home screen menu displays the Configure Detectors dialog box.

> ***Note:*** *DO NOT make any changes to the Day-Night Switch Duration or Sunset/Sunrise Offset parameters unless advised to do so by Rhythm Engineering.*

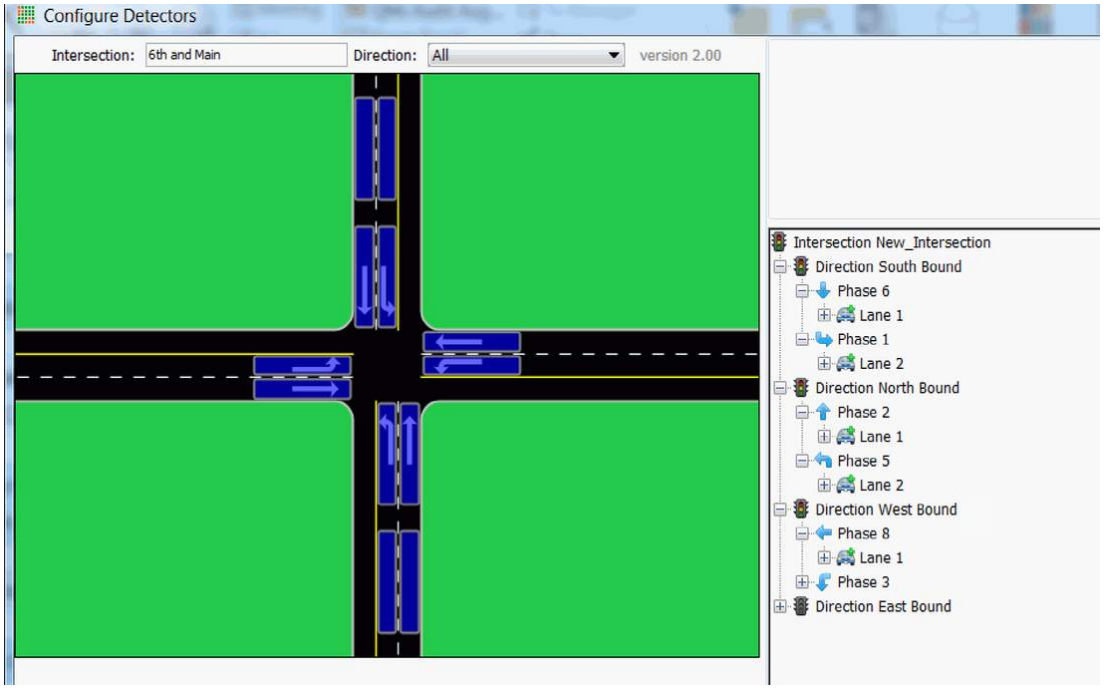


Figure 7-1. The Configure Directions screen

For a newly created intersection, you must type the name of the intersection into the Intersection field. Otherwise, the name of the intersection and the direction view displays at the top of the screen. You can change the intersection's name in the Intersection field and select which direction you want to configure from the **Direction** drop-down box.

Within the All Direction view in Configure Detectors, the following color-coded blocks have different meanings:

- The green regions indicate the external detection zones.
- The blue regions indicate the In|Sync camera detection zones.

Complete the following steps to fully configure vehicle detection for each direction:

1. Configure In|Sync detection cameras
    a. Add In|Sync detection cameras
    b. Add detection zones
    c. Draw segment lines
    d. Set presence
    e. Draw fog zones (In|Sync and In|Sync:Fusion only)
    f. Set stability and ignore zones (In|Sync:Thermal only)
2. Verify that all lanes/phases for the intersection are correct; lanes/phases are assigned when you added In|Sync detection cameras
3. Create external detectors (only for In|Sync:Fusion)
    a. Define detector settings
    b. Add external detectors to lanes
4. Update the intersection

7.3.1. Configure In|Sync detection cameras

Add In|Sync Detection Cameras

To define that an In|Sync detection camera is located on an approach:

1. Select the direction you want the camera on from the **Direction** drop-down box.
2. Verify that the **Camera** tab is selected.
3. Click the  icon to add a camera. The Add Camera dialog box displays.
4. Provide a name for the camera in the **Camera Name** field.
5. Type the IP address associated with the In|Sync detection camera in the **IP** field
6. Select the type of camera being added from the **Camera Type** pull-down list box.

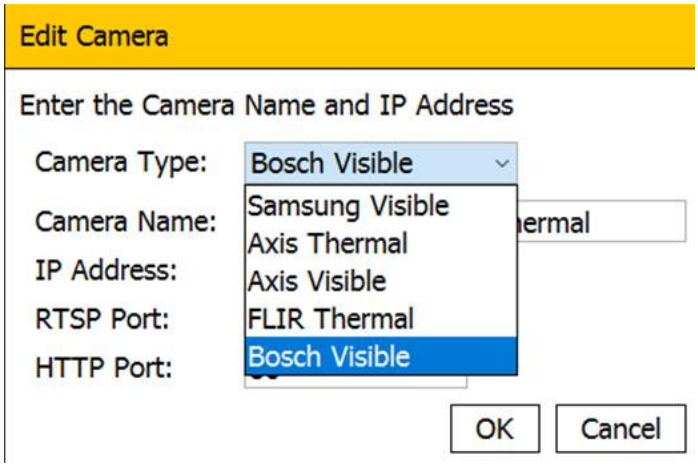


Figure 7-2. Camera type pull-down list.

- For In|Sync video detection: select the **appropriate model of camera from the drop down menu.**
- For In|Sync:Thermal detection:
  - » Via Axis thermal cameras, select **Axis Thermal**
  - » Via FLIR thermal cameras, select **FLIR Thermal**

> ***Note:*** *The RTSP and HTTP port fields may be hard-coded with the manufacturer provided values, or the default values may need to be overwritten - to meet Rhythm recommendations. The fields will be locked if there is no need to update the default values.*

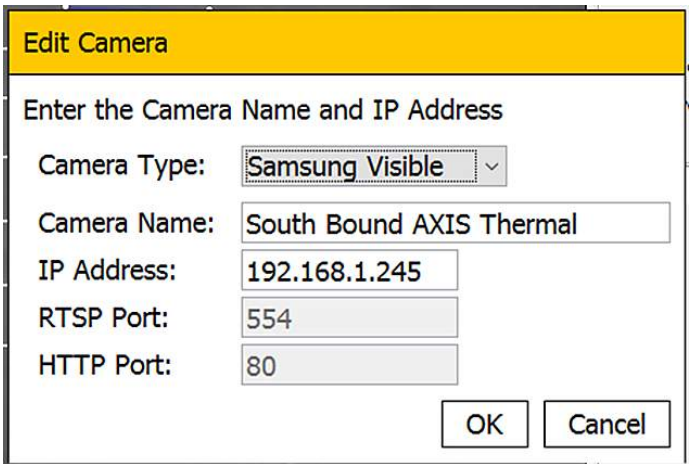


Figure 7-3. Hard-coded fields.

7. Type the distance from the stop bar in which the camera starts reporting detections in the **Min Distance from Stopbar** field.

8. Type the distance between the beginning and the end of the detection zone in the **Coverage Distance** field.

9. Repeat steps 1-6 until all detection cameras are added to the intersection.

10. Continue configuring the In|Sync detection cameras by creating detection zones, fog zones, presence segments, etc.

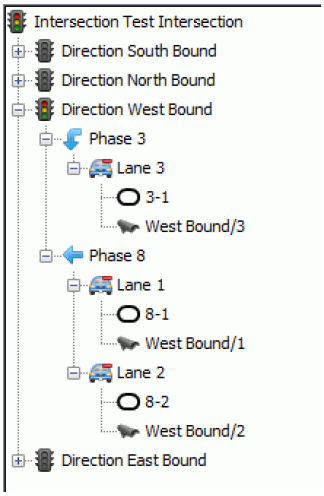


Figure 7-4. Added detection cameras to the intersection

> ***Note:*** *Adding a second camera to a direction will create an Advanced Camera Detector. An unlimited number of advanced cameras can be added per direction. After adding advanced camera detection zones, be sure to assign them to the lanes in the All Directions view.*

Add Advanced Detection Cameras

Advanced detection cameras are secondary cameras that measures traffic volume that is set back a user-specified distance from the stop bar instead of traffic volume starting from the stop bar. It is used in conjunction with stop bar detection cameras to provide the most accurate information to the In|Sync Processor. To set up and assign an advanced detection camera within the Configuration utility:

Add a camera

1. Click the **Direction** drop-down box and select the direction you want the advanced detection camera on.
2. Make sure the **Camera** tab is selected.
3. Click the  icon to add a camera. The Add Camera dialog box displays.
4. Provide a name for the camera in the **Camera Name** field.
5. Type the IP address associated with the In|Sync detection camera in the **IP** field
6. Select the type of camera being added from the **Camera Type** pull-down list box.
    - For In|Sync video detection: select **Bosch/Axis Visible**
    - For In|Sync:Thermal detection:
        - » Via Axis thermal cameras, select **Axis Thermal**
        - » Via FLIR thermal cameras, select **FLIR Thermal**
7. Click **OK**.
8. Type the distance from the stop bar in which the camera starts reporting detections in the **Min Distance from Stopbar** field.
9. Type the distance from the beginning of the detection zone to the end of the detection zone in the **Coverage Distance** field.

Assign detection zones to camera

1. Click the **Detection Zone** button.

2. Click the **Add** button.
3. Draw your zone by clicking on the image with the mouse. A polygon is created by joining the points clicked with the mouse.

> ***Note:*** *If you make a mistake, click* ***Clear*** *and re-start.*

4. When finished defining points, click the **OK** button to complete the zone/lane. A dialog box opens, displaying a choice of available phase numbers to associate with the detection zones.
5. Choose your phase number for the detection zone and click **OK**.
6. Repeat steps 2-5 for each detection zone/lane.

Assign the advanced camera to a lane

1. Select **All** from the Direction drop-down box.
2. Click the **+** icon next to the direction for which the advanced detection camera resides.
3. Click the **+** icon next to the phase for which the advanced detection camera resides.
4. Right-click the lane on which the advanced detection camera resides and select **Add Detector/"Camera Detector Name"** from the shortcut menu. The advanced camera displays on the cartoon view for that phase/lane.

7.3.2. Add Detection Zones

The proper placement of detection zones is critical for In|Sync and In|Sync:Fusion to function properly. A detection zone needs to be drawn for each lane visible in the camera view, which is used for serving vehicle demand. Sometimes right-turn only lanes are ignored. A detection zone can be added or edited by clicking the Detection Zone button. When you click Detection Zone, the area above the Add and Remove buttons is populated with the detection zone numbers and associated phase numbers.

To add a detection zone:

1. Make sure the correct direction and camera is selected by selecting the camera direction from the **Direction** drop-down box and the camera from the **Camera** drop-down box.

2. Click the **Detection Zone** button.
3. Click the **Add** button.
4. Draw your zone by clicking on the image with the mouse. A polygon is created by joining the points clicked with the mouse.

> ***Note**: If you make a mistake, click **Clear** and re-start.*

5. When finished defining points, click the **OK** button to complete the zone. A dialog box opens, displaying a choice of available phase numbers to associate with the detection zones.
6. Choose your phase number for the detection zone and click **OK**.
7. Repeat steps 1-6 for each detection zone.
8. Click **DONE** when you are finished creating detection zones.

Detection zone tips

- Draw detection zones inside the lane striping. Including lane striping can cause false positives if the camera shakes.
- Do not make the zone too narrow. Making it too narrow may cause In|Sync to miss headlights during night mode.
- If the camera angle is low and off to the side, the zones may need to be drawn above the roadway to capture cars/headlights inside of them.
- Make all lanes, except for turn bays, approximately the same length. Turn bays may not extend as far back and thru lanes.
- Extend the zone forward at least ½ of a car length beyond the stop bar to cover traffic that may creep forward and extend back as far as the lane is visible in the image.
- If the lane is exceptionally wide, only surround the area where cars are likely to travel.
- Zones should not overlap. Edit or remove detection zones

To edit or remove a detection zone:

1. Make sure the correct direction and camera is selected by selecting the camera direction from the **Direction** drop-down box and the camera from the **Camera** drop-down box.
2. Click the **Detection Zone** button.
3. Select one of the zones in the list. The zone in the approach will be highlighted in blue.
4. Delete the zone by clicking the **Remove** button or modify the corner points by clicking the Edit button, moving the corner points and clicking **OK** when done.

ADD SEGMENT LINES FOR DETECTION ZONES



Figure 7-5. Added Segment Lines

Segment lines are added after detection zones are drawn. They are used to divide detection zones into segments that are approximately one car length, which then can be used to approximate queue. To add segment lines:

1. Make sure the correct direction and camera is selected by selecting the camera direction from the **Direction** drop-down box and the camera from the **Camera** drop-down box.
2. Click the **Segment Line** button to draw segment lines that divide the detection zones into segments.

3. Click the mouse at the start of the segment.
4. Click the mouse at the end of the segment.

Note: *The length of a segment should be approximately the length of a typical passenger car.*

TIP: Click the **Refresh** button to capture an image with an actual car for better scaling.

5. Repeat as necessary to divide the entire zone into segments.
6. Click the **Done** button after all segment lines have been drawn.

By default, all segments are Advanced Segments, which do not trigger a detection. It is necessary that the first two to three segments be marked as Presence Segments in order to generate vehicle calls that are passed along to the controller. See page 83 r for details regarding defining Presence Segments.

Note: *You should draw at least two segment lines (thereby creating three detection zone segments) for each detection zone. Occasionally, short turn bays will not allow for three detection zone segments. While not ideal, this is acceptable.*

Delete segments

To delete a single segment:

1. Make sure the correct direction and camera is selected by selecting the camera direction from the **Direction** drop-down box and the camera from the **Camera** drop-down box.
2. Click the **Segment Line** button.
3. Click **Delete Segment**.
4. Click on the segment you want to delete.
5. Click **Done**.

To delete all segments:

1. Make sure the correct direction and camera is selected by selecting the camera direction from the **Direction** drop-down box and the camera from the **Camera** drop-down box.

2. Click the **Segment Line** button.
3. Click **Clear**. You are asked if you are sure you want to delete all segments.
4. Click **Yes** to delete all segments.
5. Click **Done**.

Edit segments

To edit a segment:

1. Make sure the correct direction and camera is selected by selecting the camera direction from the **Direction** drop-down box and the camera from the **Camera** drop-down box.
2. Click the **Segment Line** button.
3. Click **Edit**.
4. Click on one end of the segment line and drag it to its new position.
5. Click on the other end of the segment line and drag it to its new position.
6. Click **Done**.

DEFINE PRESENCE SEGMENTS

At least two segments in each detection zone should be marked as a Presence Segment. When a detection occurs inside a segment marked as a presence segment, the phase is considered to be in need of service. Detections in segments that are not presence segments are considered for queue counts and volume density analysis, but are not sufficient to bring a call to a phase. To define presence segments:

1. Make sure the correct direction and camera is selected by selecting the camera direction from the **Direction** drop-down box and the camera from the **Camera** drop-down box.
2. Click the **Set Presence** button.

> ***Note:*** *To clear all presence segments, click the* ***Clear*** *button.*

3. Click anywhere within a segment that should be a presence segment. A dialog box opens, requesting presence delay, which is defined in seconds. Presence delay is the number of seconds a car must be present before it is considered a presence.

> ***Note:*** *To change a presence delay that has already been entered, click within that segment and type a new presence delay.*

To delete a single presence point, click within that segment and click the **Delete** button in the Presence Delay dialog box.



Figure 7-6. Presence Dialog Box

4. If no delay is desired, type 0 and click the **OK** button on the dialog box. That segment is set as a presence detector with no detector delay.

> ***Note:*** *Right-turn lanes can be marked with detector delay values of 5 or 10 seconds to allow vehicles to make a right-turn on red. A 10 second delay is standard.*
> *The delay value is shown in all segments that have been set as Presence Segments.*

5. Click the **Done** button after all Presence Segments have been marked.

> ***Note:*** *There should be at least two presence segments at the front of each detection zone. Do not mark every segment as a presence segment. This can lead to false positives.*
> *Typically two to four presence segments per lane are adequate.*

7.3.3. Set Fog Zones (In|Sync and In|Sync:FUSION Only)

Fog zones are used by In|Sync to verify that the camera has a clear view of traffic. Fog zones are drawn around unchanging features in the camera view that have high contrast with the background, such as traffic signals and sidewalks. When In|Sync can no longer see high

contrast within the fog zone(s), the camera information is considered unreliable and fog mode is entered. At least one fog zone must be defined.

To add fog zones:

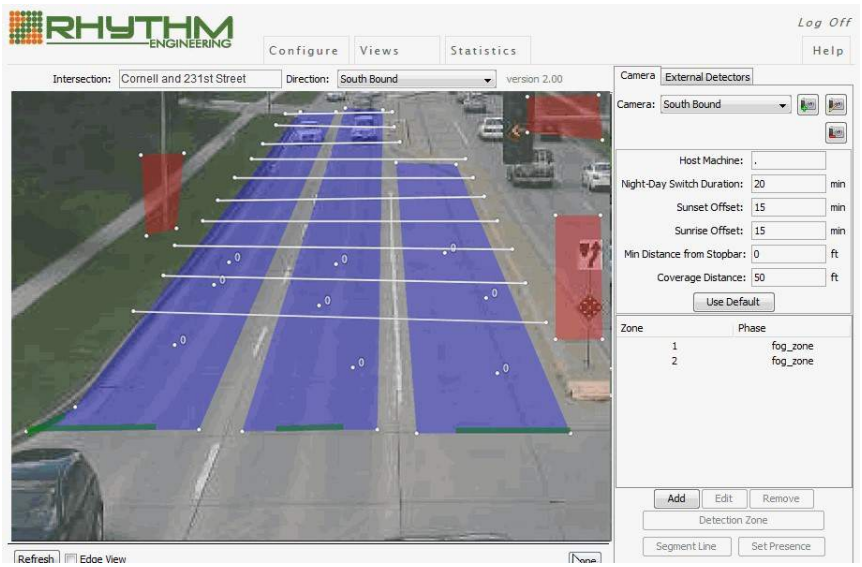


Figure 7-7. Defining Fog Zones

1. Make sure the correct direction and camera is selected by selecting the camera direction from the **Direction** drop-down box and the camera from the **Camera** drop-down box.
2. Click the **Fog Zone** button.
3. Click the **Add** button.
4. Click points within the view to define the edges of the fog zones. If you make a mistake, click the **Clear** button to start over.
5. When done defining fog zones, click the **Done** button. If you are finished with all your editing, click the **Update Intersection** button.

Fog zone tips

- Fog zones can be drawn around objects that have high contrast with the background.
- Do not draw a single fog zone around multiple objects.

- Make the fog zone large enough around the point of interest to allow for camera shake
- Avoid objects that might be obscured or that have a background that changes often.
- Good candidates for fog zones include light poles, traffic signs, business signs and stone markers.
- Bad candidates for fog zones include temporary signs, bushes and objects in front of a parking lot.
- Two to three fog zones is typically enough.
- Check the Edge View check box and click the Refresh button to see the areas/edges of high contrast in the image (see page 98).

Remove fog zones

To remove fog zones:

1. Make sure the correct direction and camera is selected by selecting the camera direction from the **Direction** drop-down box and the camera from the **Camera** drop-down box.
2. Click the **Fog Zone** button.
3. Select the appropriate zone number in the zone list. The selected zone is highlighted in red.
4. Click the **Remove** button.

7.3.4. Set Stabilization Zones (In|Sync:THERMAL Only)

Stabilization zones are areas within the camera's view that are fixed. These reference points establish areas that are known to have no movement and should be positioned on the edges of the camera view. Do not position of stabilization zone on the area of screen that is to be monitored for movement. It should also never be blocked by other objects, such as parked cars. Good objects that can be used for stabilization zones are tree trunks or buildings.

> *Note: A minimum of two zones, one on each side of the camera view, is required for optimal image stabilization.*

To add stabilization zones:

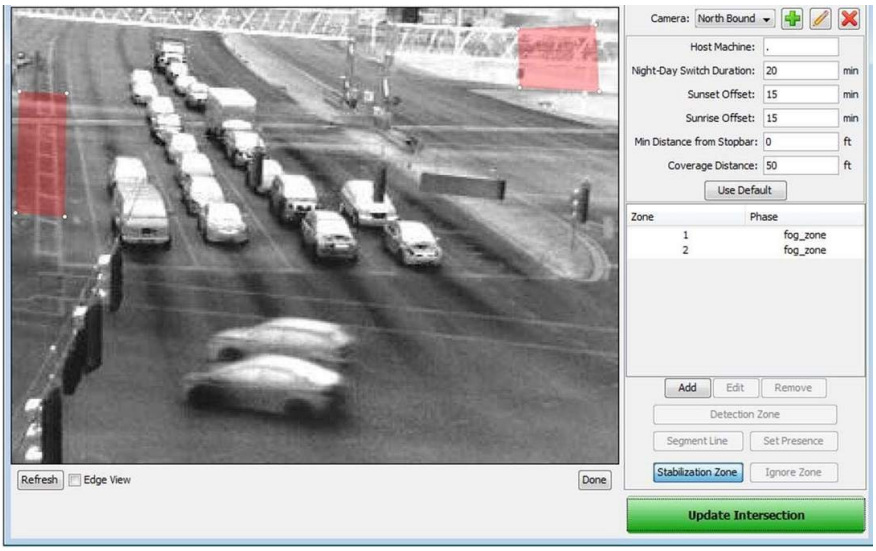


Figure 7-8. Defining Stabilization Zones

1. Make sure the correct direction and camera is selected by selecting the camera direction from the **Direction** drop-down box and the camera from the **Camera** drop-down box.
2. Click the **Stabilization Zone** button.
3. Click the **Add** button.
4. Click points within the view to define the edges of the stabilization zones. If you make a mistake, click the **Clear** button to start over.
5. When done defining stabilization zones, click the OK button. If you are finished with all your editing, click the **Update Intersection** button.

Stabilization tips

- It's beneficial to have at least two stabilization zones, one on each side of the camera view. Each stabilization zone works to pin down the image. When there's only a single stabilization zone, that pin becomes a pivot. Any image shaking due to camera movement causes the entire frame to "twist" slightly around that area. Having one stabilization zone on the left and one on the right does a better job of nailing down the image.
- When drawing a stabilization zone, use areas of the screen then will never have vehicle or pedestrian traffic entering into the zone. Always consider whether a passing vehicle might

move through the proposed stabilization zone. If a vehicle could possibly obstruct the view, do not use it as a stabilization zone.

Remove stabilization zones

To remove stabilization zones:

1. Make sure the correct direction and camera is selected by selecting the camera direction from the **Direction** drop-down box and the camera from the **Camera** drop-down box.
2. Click the **Stabilization Zone** button.
3. Select the appropriate zone number in the zone list or the stabilization zone on the camera view. The selected zone is highlighted in red.
4. Click the **Remove** button.

7.3.5. Set Ignore Zones (In|Sync:THERMAL Only)

Ignore zones are the areas of the camera view that In|Sync should disregard when looking for motion. Items that a user may want to ignore are things that can sway in the wind, such as signs, tree branches or flags or items that can block vehicle detection, like traffic signal heads. This helps to eliminate false positives caused by movement that is not vehicle movements, such as span wires crossing the camera's view of the oncoming traffic and signal heads blocking some portion of the approach.

> ***Note:*** *Since In|Sync only looks for motion within defined detection zones, do not draw ignore zones outside of detection zones. It won't cause any particular detriment for processing to draw ignore zones outside of detection zones but it's not a good use of resources in general.*

To add ignore zones:

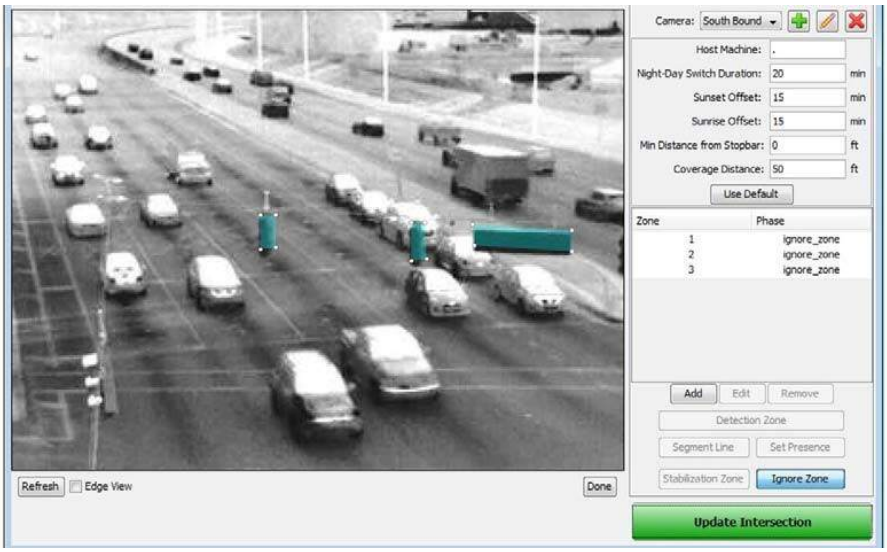


Figure 7-9. Defining Ignore Zones

1. Make sure the correct direction and camera is selected by selecting the camera direction from the **Direction** drop-down box and the camera from the **Camera** drop-down box.
2. Click the **Ignore Zone** button.
3. Click the **Add** button.
4. Click points within the view to define the edges of the ignore zones. If you make a mistake, click the **Clear** button to start over.
5. When done defining ignore zones, click the **OK** button. If you are finished with all your editing, click the **Update Intersection** button.

Remove ignore zones

To remove ignore zones:

1. Make sure the correct direction and camera is selected by selecting the camera direction from the **Direction** drop-down box and the camera from the **Camera** drop-down box.
2. Click the **Ignore Zone** button.
3. Select the appropriate zone number in the zone list or the ignore zone on the camera view. The selected zone is highlighted in red.

4. Click the **Remove** button.

CONFIRM GOOD EDGE LINES

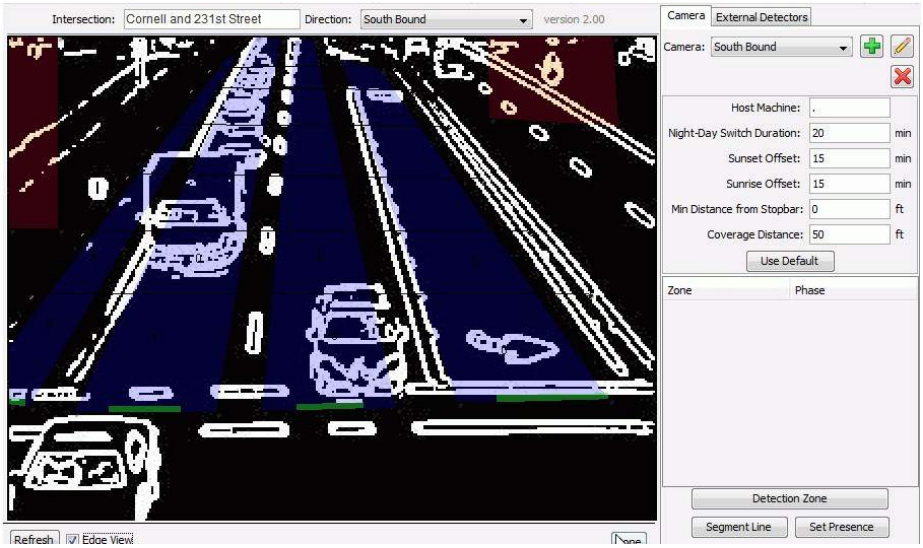


Figure 7-10. Edge View

To confirm that a certain object creates a good edge line to draw a fog/contrast zone over:

1. Click **Update Intersection** to update the camera information.
2. Click the **Edge View** check box (bottom left corner of the screen).
3. Click the **Refresh** button. An edge view is generated.
4. De-select the **Edge View** check box and click the Refresh button again to return to the normal camera view.
5. Click **Done** after all fog zones have been verified.

CONFIGURE EXTERNAL DETECTORS (IN|SYNC:FUSION ONLY)

After defining the lanes within a phase, you must associate detection zones with the lane. **If you have already set up external detectors within In|Sync:**

1. If the cartoon map view of the intersection is not showing, select **All** from the **Direction** dropdown box.

2. Click the **+** icon next to the direction where you want to assign the external detector. This shows all the phases within the direction.
3. Click the **+** icon next to phase in which you want to assign the external detector. This shows all the lanes within the phase.
4. Right-click the lane and select **Add Detector**. A list of detectors will display in the short-cut menu. Select the one you want from the menu.

If no detectors currently exist within In|Sync:

1. If the cartoon map view of the intersection is not showing, select **All** from the **Direction** dropdown box.
2. Click the **+** icon next to the direction where you want an external detector created.
    a. If no phases exist for the direction, right-click the direction and select **Add Phase/ phase #** from the short-cut menu.
    b. If no lanes exist for a phase, right-click the phase and select **Add Lane** from the shortcut menu.
3. Right-click the phase and select Create>External Detector. The External Detector Details dialog box displays.

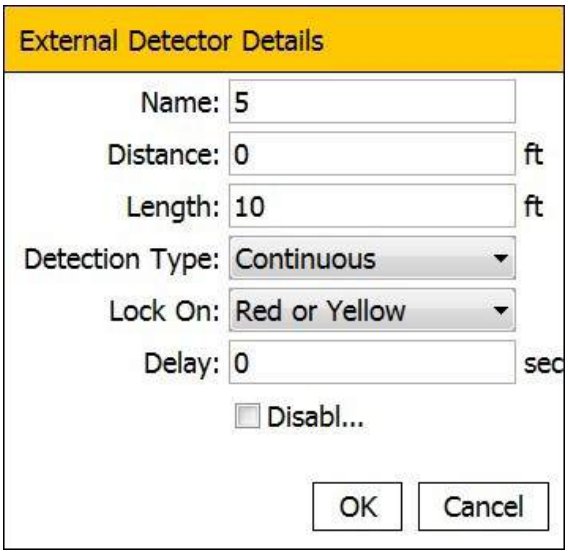


Figure 7-11. The External Detector Details dialog box

From this dialog box, you can define the following:

- The name of the detector. To ensure consistency, label the detector the same as it is shown in the intersection's traffic signal plan.
- The distance from the stop bar in which the detector starts
- Note: If the detector starts in front of the stop bar, enter 0.
- The length of the detection zone
- The detection type
- Whether Lock On is set for the detector
- Delay, which is the amount of time before a detection should register a presence

> ***Note:*** *If you know that there is a potential for a car to slip past a detector so that it is not going to register a presence, we recommend that you turn on the Lock On attribute. Selecting Red or Amber Lock On is recommended, but at least Lock On Red should be configured in this case. Lock On Amber only locks when the signal is Amber and may not be sufficient in this case.*

Unassign an external detector from a lane

To remove an external detector from a lane:

1. Right-click the detector in the tree view.
2. Select **Delete** from the shortcut menu.

> ***Note:*** *The definition of the detector still exists; it has just been removed from the lane.*

Change a detector's settings

To change the settings assigned to a detector:

1. Click the external detector that you want to change.
2. Click the **Edit Detector Details** button. The External Detector Details dialog box displays.
3. Enter the new settings (name, distance from stopbar, length, etc.) into the External Detector Details dialog box and then click OK.

CONFIRM DETECTION CAMERAS/EXTERNAL DETECTORS ARE CORRECTLY ASSIGNED

After defining all detection cameras, verify that each camera is assigned to the correct direction and phase and that all lanes are correctly assigned. To do this:

1. Select **All** from the Direction drop-down box. A cartoon view representation of the intersection displays on the left, while a tree organizational view displays to the right.
2. Click the **+** icon in the tree view for each direction to verify that all phases for an approach exist.
3. Click the **+** icon in the tree view for each phase to verify that all lanes exist within each phase.

If a phase/lane is incorrectly assigned to a detection camera:

1. Right-click on the direction and select **Clear** from the short-cut menu.
2. Select the camera direction from the **Direction** pull-down menu.
3. Click the  icon to add a camera. The Add Camera dialog box displays.
4. Provide a name for the camera in the **Camera Name** field.
5. Type the IP address associated with the In|Sync detection camera in the **IP** field
6. Select the type of camera being added from the **Camera Type** pull-down list box.
   For In|Sync video detection:
   - » select **Bosch/Axis Visible**

For In|Sync:Thermal detection:

» Via Axis thermal cameras, select **Axis Thermal**

» Via FLIR thermal cameras, select **FLIR Thermal**

7. Click **OK**.
8. Type the distance from the stop bar in which the camera starts reporting detections in the **Min Distance from Stopbar** field.
9. Type the distance from the beginning of the detection zone to the end of the detection zone in the **Coverage Distance** field.
10. Click **Detection Zone**.
11. Click **Add** to add the detection zones.
12. Draw the detection zones.
13. Click **OK** to indicate that you are finished drawing the detection zone. The Zone Information dialog box displays.
14. Select the correct phase from the **Choose a Phase** drop-down list.
15. Click **OK**.

If a phase is incorrectly assigned to an external detector:

1. Find the external detector within the tree view.
2. Right-click on the detector and select **Delete** from the short-cut menu. The external detector is removed from the lane; however, it is not removed from the Configuration utility.
3. Right-click on the lane in the tree view and either select **Add Detector** to assign an existing external detector to the lane or click **Create Detector** to create a new external detector to the lane.

SAVE THE CONFIGURATION

In order to save your configuration work, you must click the Update Intersection button to save configuration changes to the processor. You can do this after each direction is configured

or after the configuration changes for all four directions have been made (to save the work all at once).



Figure 7-12. Updating an Intersection Confirmation Message

Note: *Settings are NOT saved until the Update Intersection button is clicked.*

TIP: If you make a mistake during configuration editing and wish to revert to the current configuration settings without saving, close the applet and re-open it by selecting Configure Detectors from the Settings menu.

7.4. Grabbing Camera Backgrounds

After creating or adjusting configuration details within the Configure applet and confirming camera views, you must grab camera backgrounds for each camera view. The background is used as a reference for car detection and should be representative of average lighting/visibility conditions (ideally captured in late morning or early afternoon). It is also used to determine visibility conditions.

Make sure there are no cars in the detection zone when grabbing a background image.

1. If the camera views screen is not displayed, click **View** from the Home screen.
2. Click the camera view that you want to grab a background. An enlarged view of the camera displays.
3. If possible, wait until the lanes are free of traffic and click the **Grab Background** button.
4. Click on the camera view again to minimize it and show all the other camera views.
5. Repeat steps 2-4 for the next camera view.

The camera moves into fog mode when the processor determines that it does not have a clear image for dependable video vehicle detection. In this situation, In|Sync references historical data collected for each phase associated with the unclear view. The historical data is based on green splits for that time of day, on that particular day of the week, for the past 4 weeks, in 15 minute increments. This allows In|Sync to make a reasonable estimation of how much time should be allotted to each phase affected by the fog mode (preferable to MAX RECALL).

The camera will move out of fog mode automatically when the camera view clears.

> ***Note:*** *You can use the* ***Clear Background*** *button to erase any learned background. This will lead to false positives, but is valuable if the background is truly unusable (e.g. if you accidentally grab a background while a car is sitting at the stop bar and you need to temporarily clear the background until it moves).*



Figure 7-13. Verifying Proper System Behavior

The red and green rectangles at the front of each detection zone indicate the current status of the signal head for each associated phase. A detection segment will be highlighted when vehicles are detected.

7.5. Configuring Network Settings

7.5.1. Setting Processor IP Address

This option is to be used when you need to set the IP address on the processor during the initial setup of an intersection or if you reset the processor to factory defaults and the processor needs to set up again. To do this:

1. Select **Network Settings** from the Settings screen. The Update Network Settings dialog box displays.
2. Type in the new IP address, subnet and gateway in the **Change To** column.
3. Click the **Update** button.

7.5.2. Setting System Time, Date and/or Time Zone

This option is to be used when you need to set the time, date and time zone on the processor during the initial setup of an intersection or if you reset the processor to factory defaults and the processor needs to be set up again.

7.5.3. Setting GPS Coordinates

GPS coordinates are usually set only once, when you initially set up the processor at an intersection. We recommend that GPS coordinates are set from the Intraffic software; however, if you are in the field deploying an In|Sync Processor, you can use the Change GPS Coordinates functionality to quickly estimate the GPS coordinates until you can change them to a more accurate setting later.

> ***Note:*** *If an intersection is using a secondary In|Sync Processor as a video only processor, you do not need to define the NTP settings on it.*

To set the processor GPS location with an approximate location:

1. Use the scroll wheel on the mouse to zoom in to an area of the map. Additionally, you can

click and drag an area of the map to view it better.

2. Click an approximate area of the map where the processor is located. The GPS coordinates are automatically entered in the Latitude and Longitude fields.
3. Click **Save**.

To set the processor's GPS coordinates at the intersection with an exact location:

1. Select **GPS Coordinates** from the Settings screen.
2. Type in the latitude of the intersection's location in the **Latitude** field.

> ***Note:*** *The entered GPS coordinates must be in decimal notation (minutes.fractional seconds).*

3. Type in the longitude of the intersection's location in the **Longitude** field.
4. Click **Save**.

> ***Note:*** *To change the values back to the original latitude and longitude parameters, click Cancel.*

7.5.4. Setting the NTP Server

For most In|Sync systems, the In|Sync Processors act as peers and automatically synchronize with each other. However, if your network uses a Network Time Protocol (NTP) server to synchronize the time of day among a set of distributed time servers and clients, follow the instructions below:

1. Select **NTP Server** from the Settings screen.
2. Type the IP address of the In|Sync Processor being used as the NTP server in the Server IP field.
3. Click **Test** to make sure the server is communicating.
4. Click Save.

> ***Note:*** *If an intersection is using a secondary In|Sync Processor as a video only processor, you do not need to define the NTP settings on the video only processor.*

Even if the NTP server goes down, the In|Sync Processors still synchronize with each other.Connecting to Controller

7.6. Connecting with ABC Y-Cable

1. Place the controller into FLASH.
2. Attach the connector labeled J4/Out to the Out or Output port location on the processor.
3. Attach the J5/INPUT2 connector to the port labeled In or INPUTS 2.
4. Attach the J6/INPUTS1 connector to the port labeled Aux or INPUTS 1.
5. Disconnect the A, B and C cables from controller.
6. Attach the A connector that you just removed from the controller to the In|Sync Y-cable's "A Cabinet" connector.
7. Attach the B connector that you just removed from the controller to the In|Sync Y-cable's "B Cabinet" connector.
8. Attach the C connector that you just removed from the controller to the In|Sync Y-cable's "C Cabinet" connector.
9. Connect the "A Controller" connector on the In|Sync ABC Y-cable to the A port on the controller.
10. Connect the "B Controller" connector on the In|Sync ABC Y-cable to the B port on the controller.
11. Connect the "C Controller" connector on the In|Sync ABC Y-cable to the C port on the controller.
12. Take the controller out of FLASH.

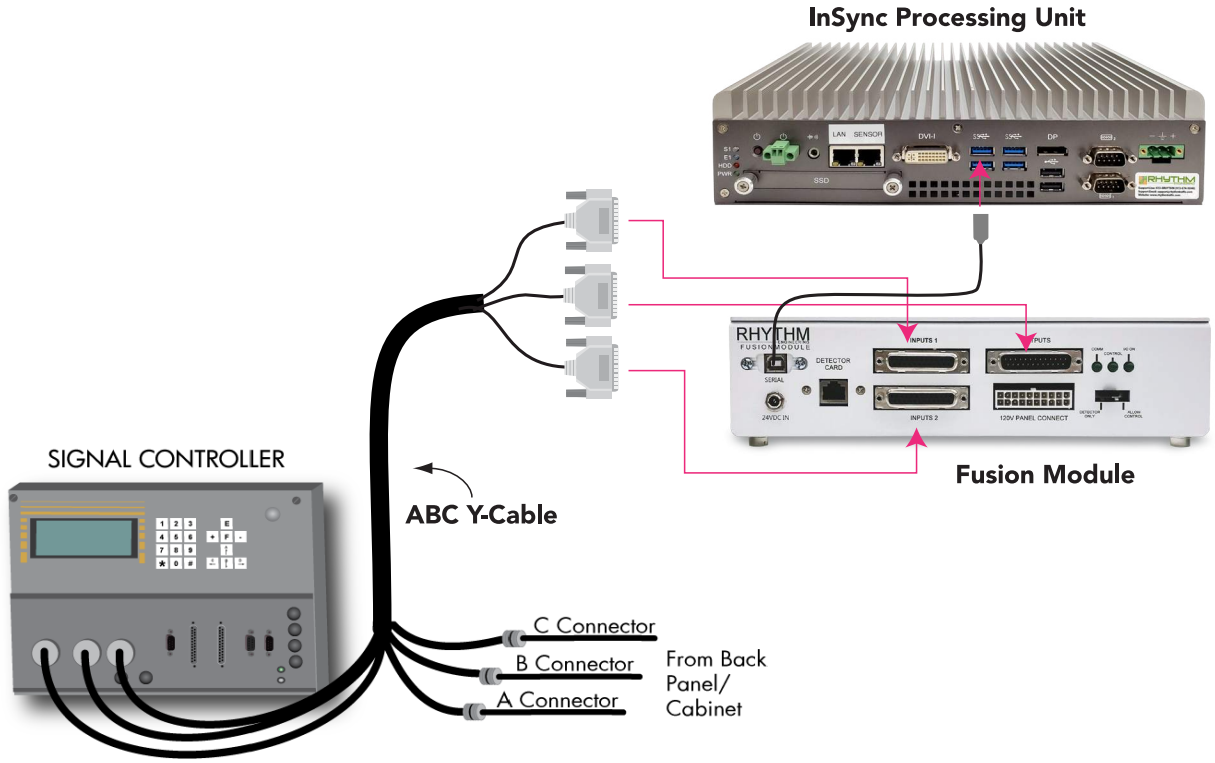


Figure 7-14. ABC Y-Cable connections

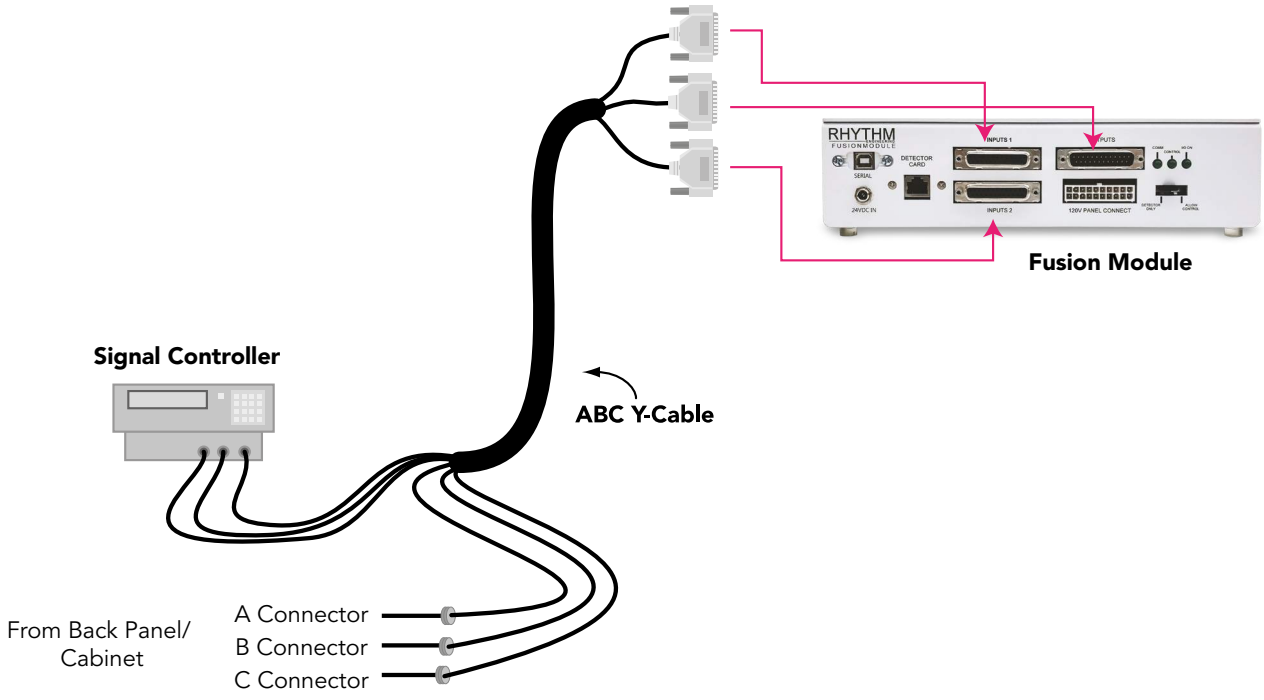


Figure 7-14.1 ABC Y-Cable connections to Fusion Module

> ***Note:*** *Verify that inputs are being received (from the detectors if used and Green Returns from the controller) and that outputs are being sent to the controller by manually placing calls from In|Sync and verifying in the controller.*

> ***Note:*** *After installing the In|Sync Processor, you should run Detector mode for two weeks to verify that inputs and outputs are being sent properly, to collect sufficient historical datafor adaptive operation and to allow enough time for a corridor to be installed.*

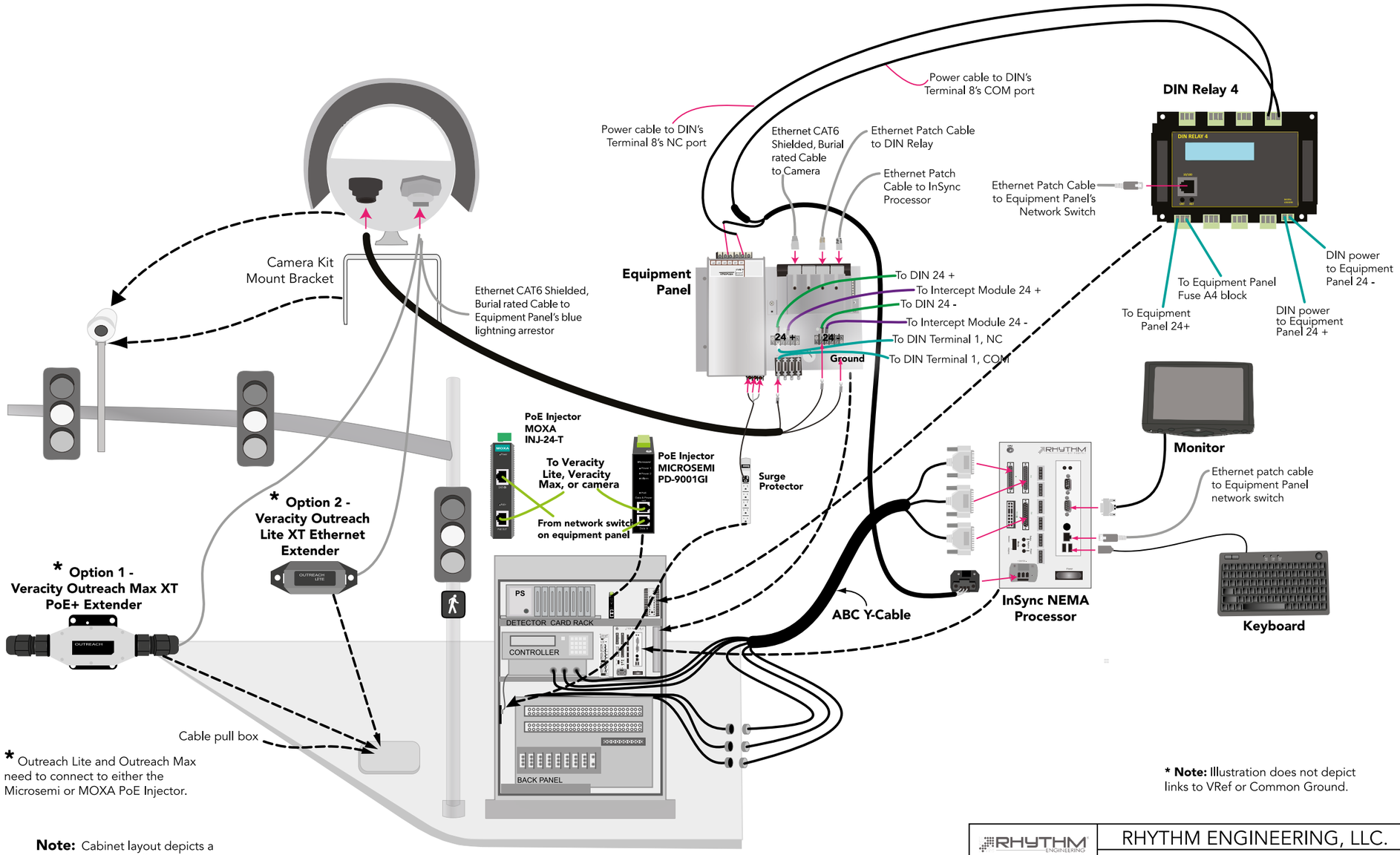
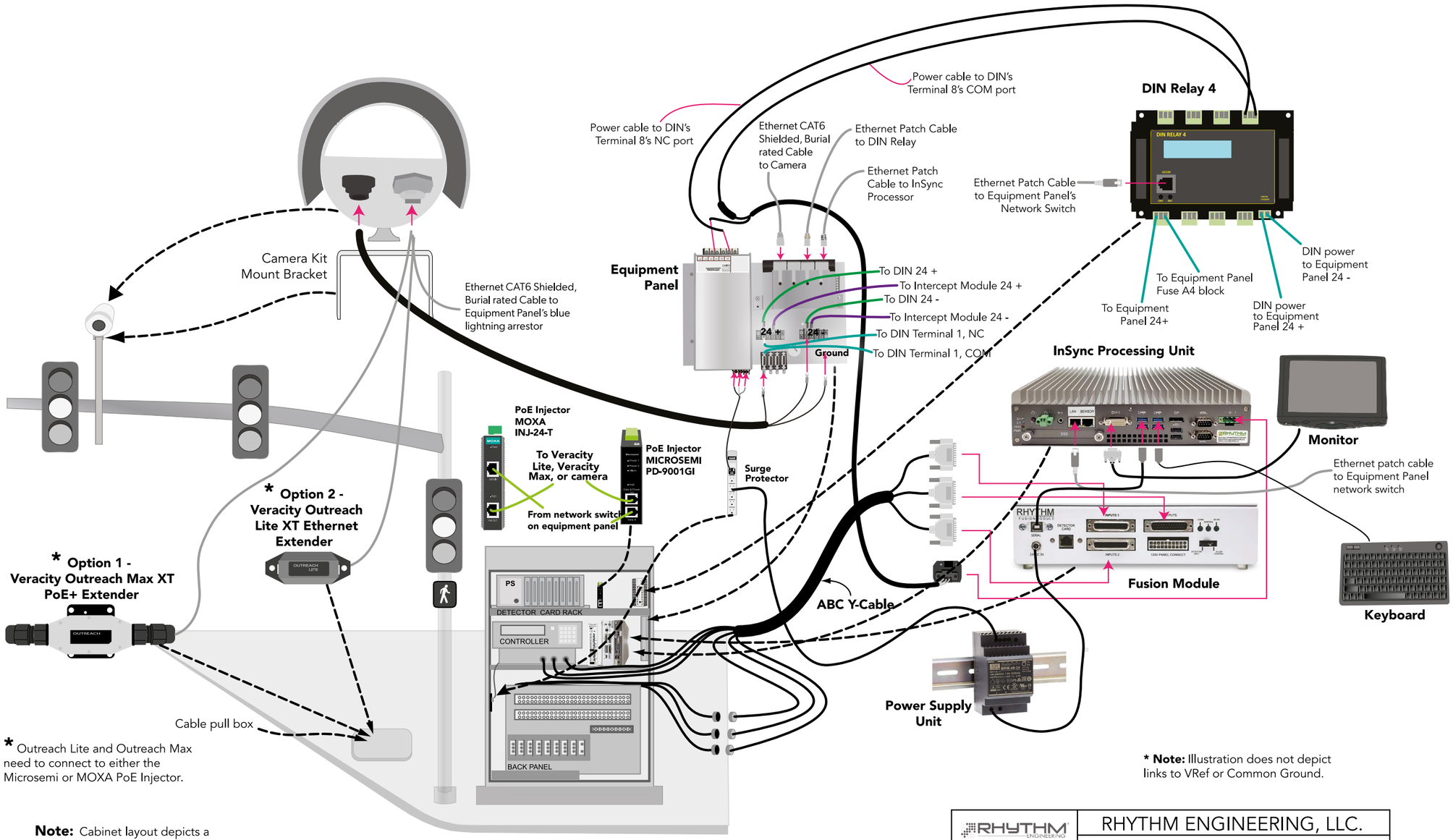


Figure 7-15. ABC Y-cable equipment connections in an In|Sync/In|Sync:Fusion installation with ET975K Processor



RHYTHM ENGINEERING	RHYTHM ENGINEERING, LLC.		
	INSYNC ADAPTIVE TRAFFIC CONTROL SYSTEM		
	DATE: 16/02/2021	VERSION:	CABINET TYPE: NEMA
		EQUIPMENT: A/B/C Y-CABLES	

Figure 7-15.1 ABC Y-cable equipment connections in an In|Sync/In|Sync:Fusion installation with Bluefin

Processor

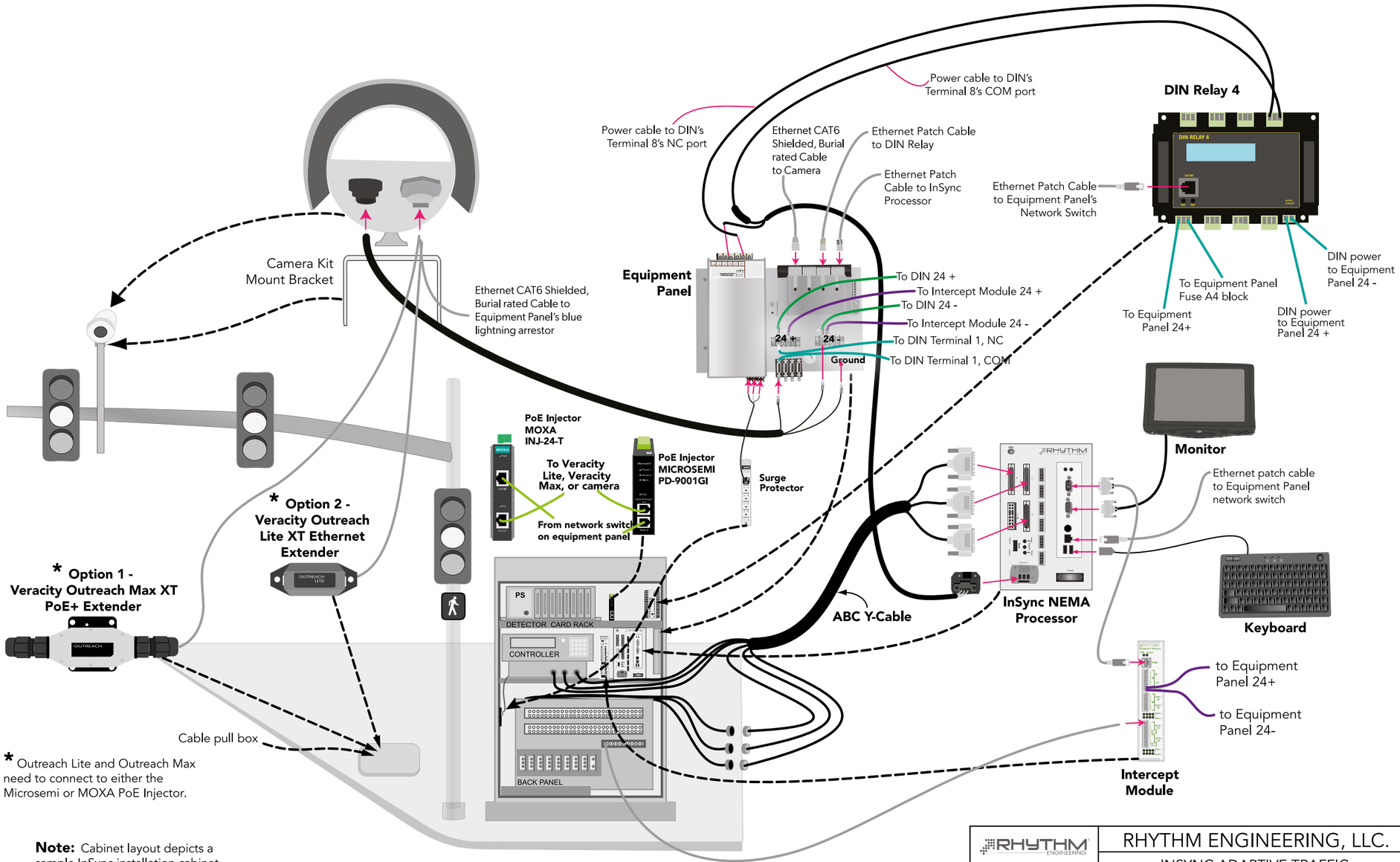


Figure 7-16. ABC Y-cable equipment connections with ped interception in an In|Sync/In|Sync:Fusion installation with ET975K Processor

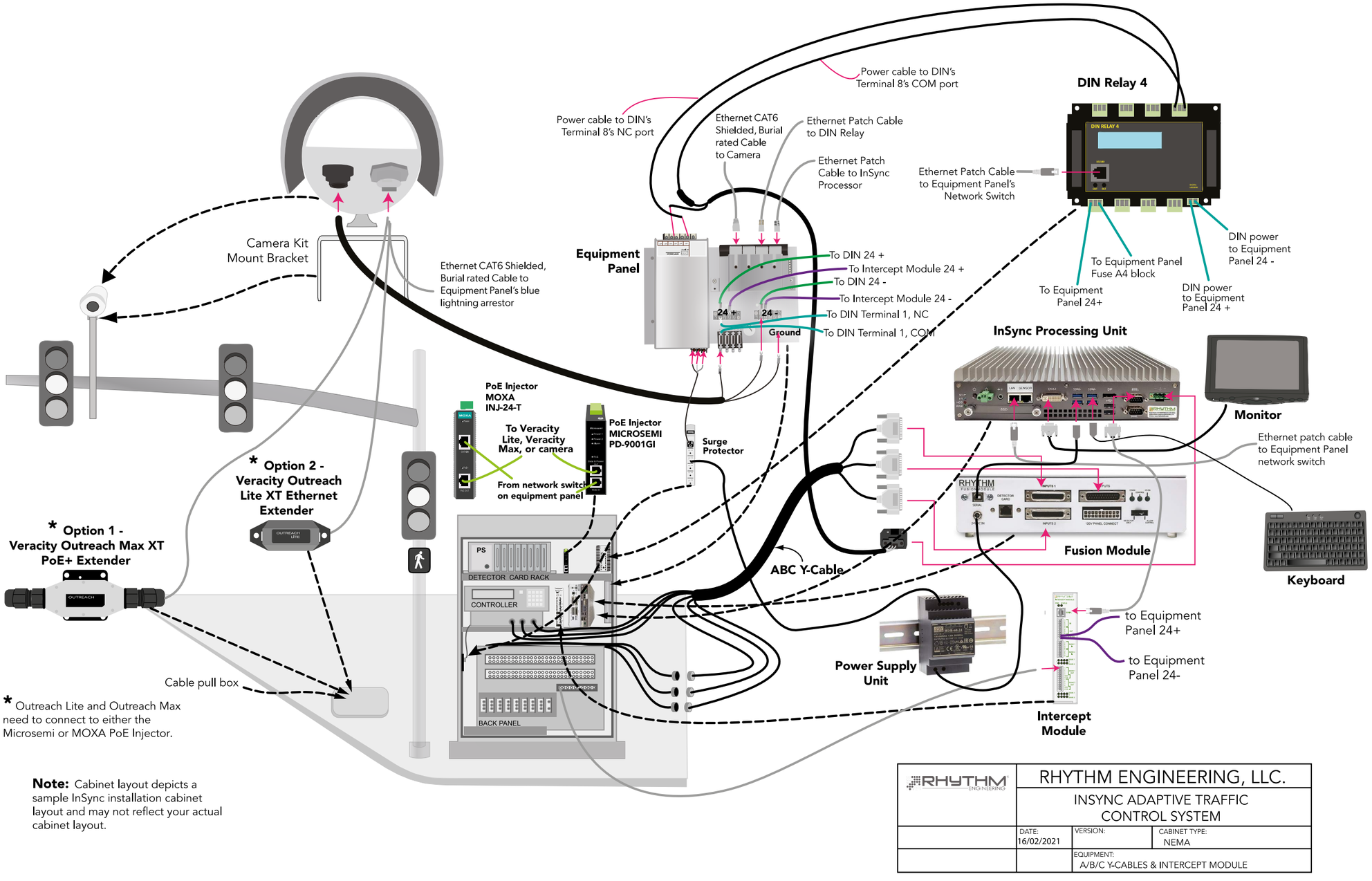


Figure 7-16.1 ABC Y-cable equipment connections with ped interception in an In|Sync/In|Sync:Fusion installation with Bluefin Processor

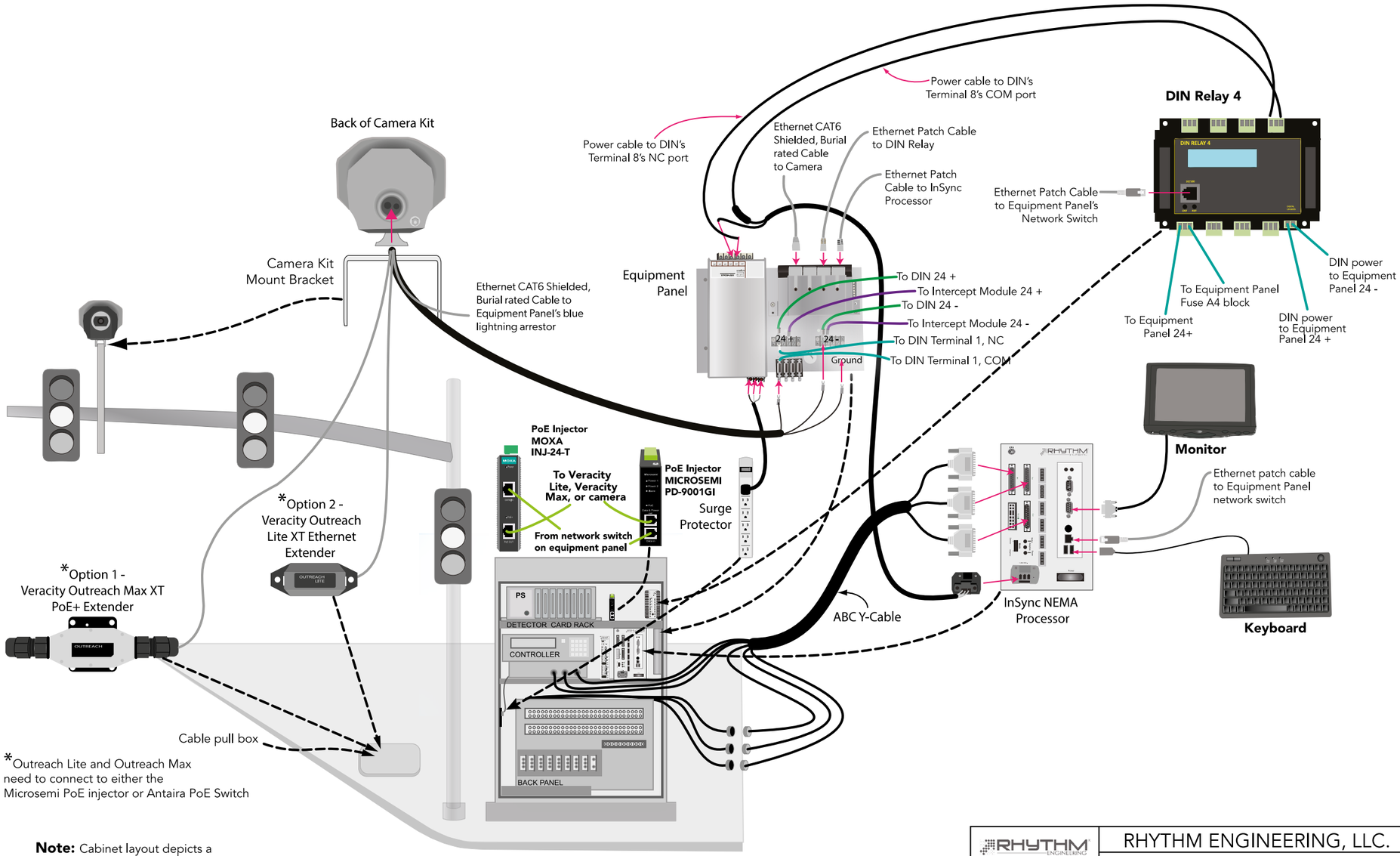


Figure 7-17. ABC Y-cable equipment connections in an In|Sync/In|Sync:Thermal installation with ET975K Processor

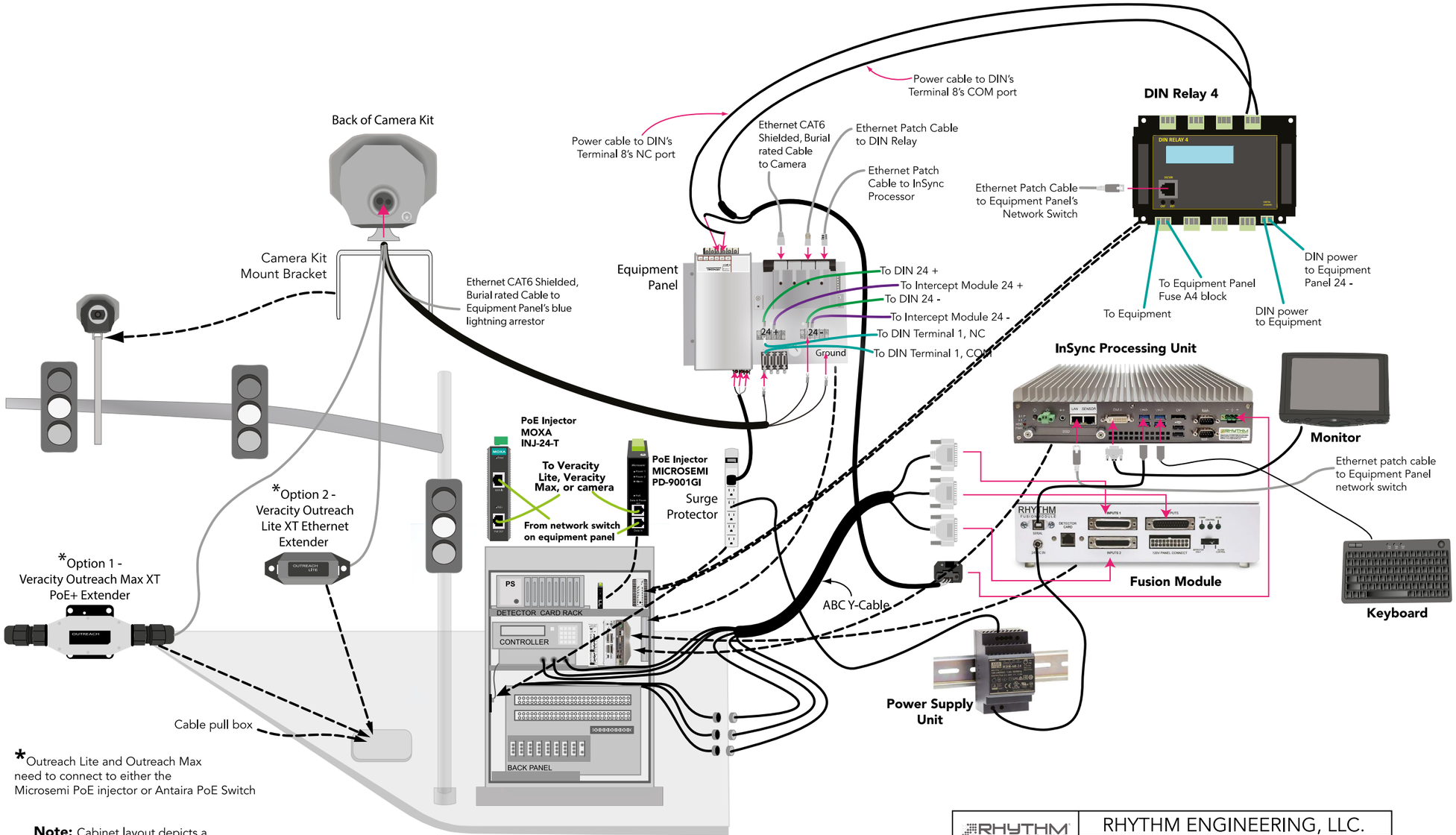


Figure 7-17.1 ABC Y-cable equipment connections in an In|Sync/In|Sync:Thermal installation with Bluefin Processor

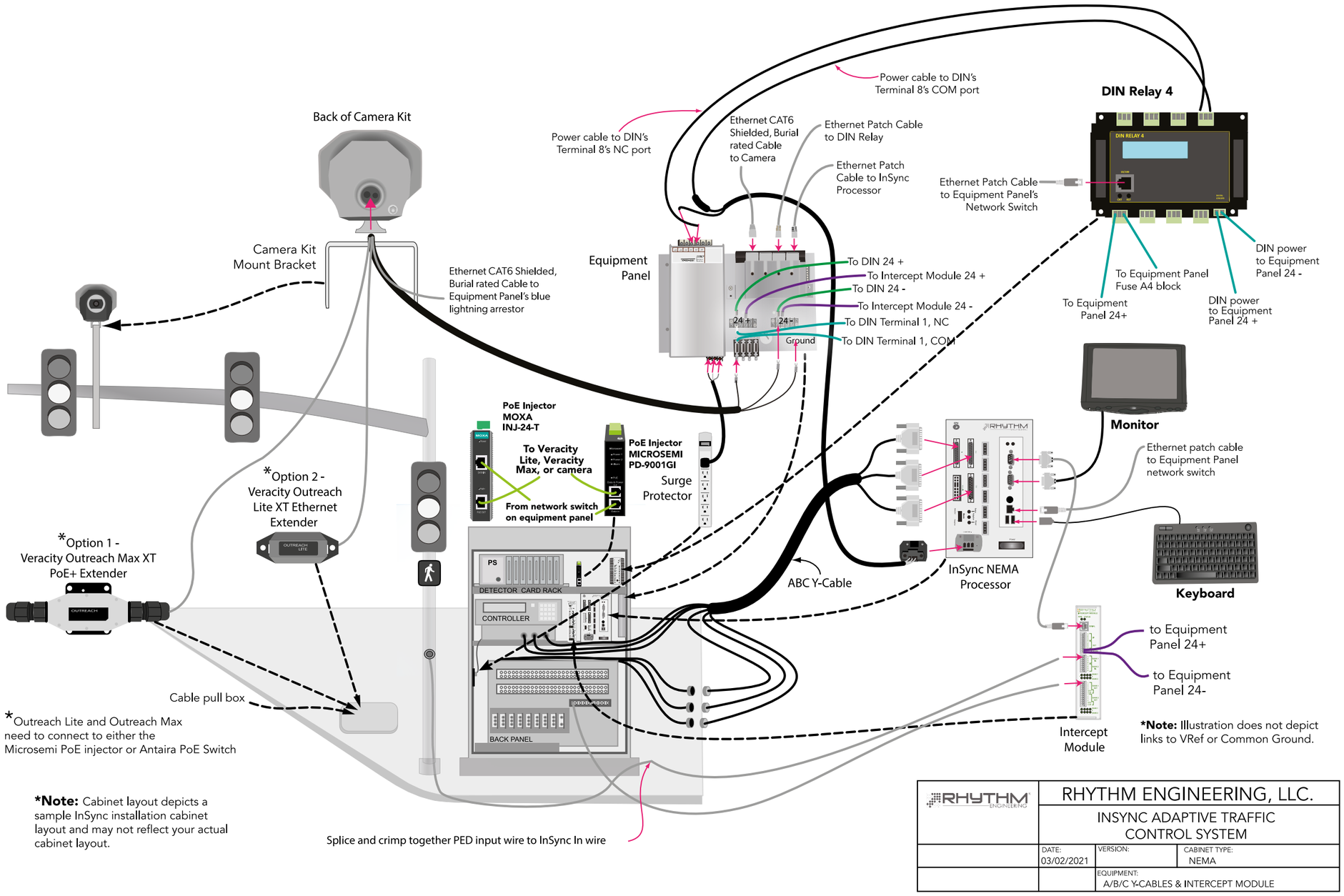


Figure 7-18. ABC Y-cable equipment connections with ped interseption in an In|Sync:Thermal installation with ET975K Processor

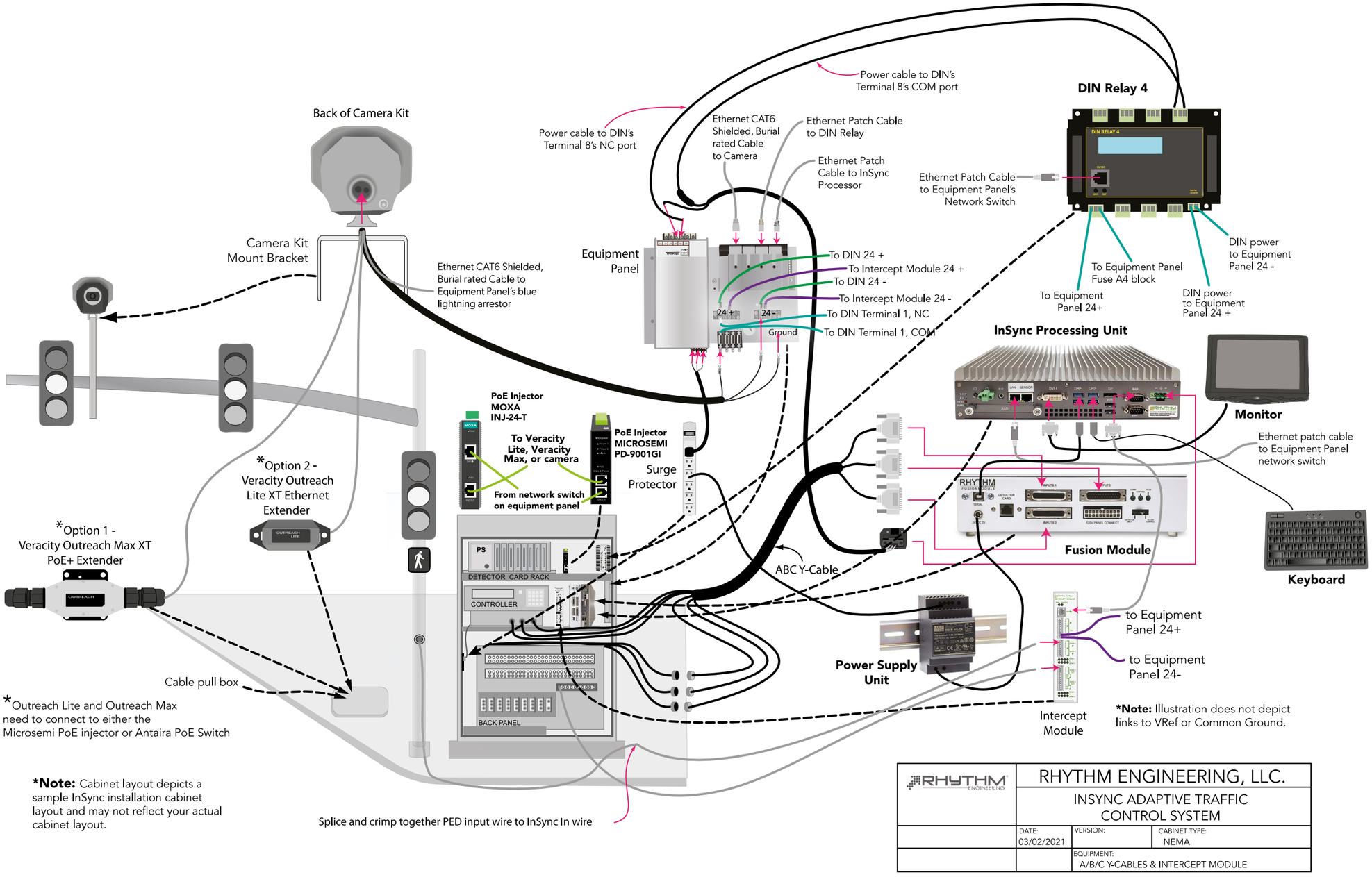


Figure 7-18.1 ABC Y-cable equipment connections with ped interseption in an In|Sync:Thermal installation with Bluefin Processor

In the event that your installation includes using both the ABC Y-cables and an SDLC connector, you will want the In|Sync Processor to monitor those inputs coming from the detector rack. When connecting to the controller using the SIM (SDLC Intercept Module), you need a serial cable to connect the processor to the SIM, the existing SDLC cable to connect the SIM to the SDLC data bus and a separate SDLC cable to connect the SIM to the detector rack BIUs. To install the SIM, check the next section.

7.7. Connecting via C1 Y-Cable

Rhythm Engineering provides cabling options to directly connect into your existing detectors.

The following section outlines how to connect into your existing detections using the C-1 Ycable.

1. Safely put the intersection/controller into flash.
2. Plug the connector labeled J4/Out to the OUTPUT port location on the processor.
3. Plug the J5/INPUT2 connector into the port labeled In/INPUTS 2 and plug the J6/INPUTS1 connector into the port labeled Aux or INPUTS 1.
4. Disconnect the original C1 cable that is connected to the signal controller and attach it to the female C1 connector located in the middle of the cable.
5. Safely take the intersection/controller out of flash. Connect the male C1 connector of the C1 Y-cable into the signal controller

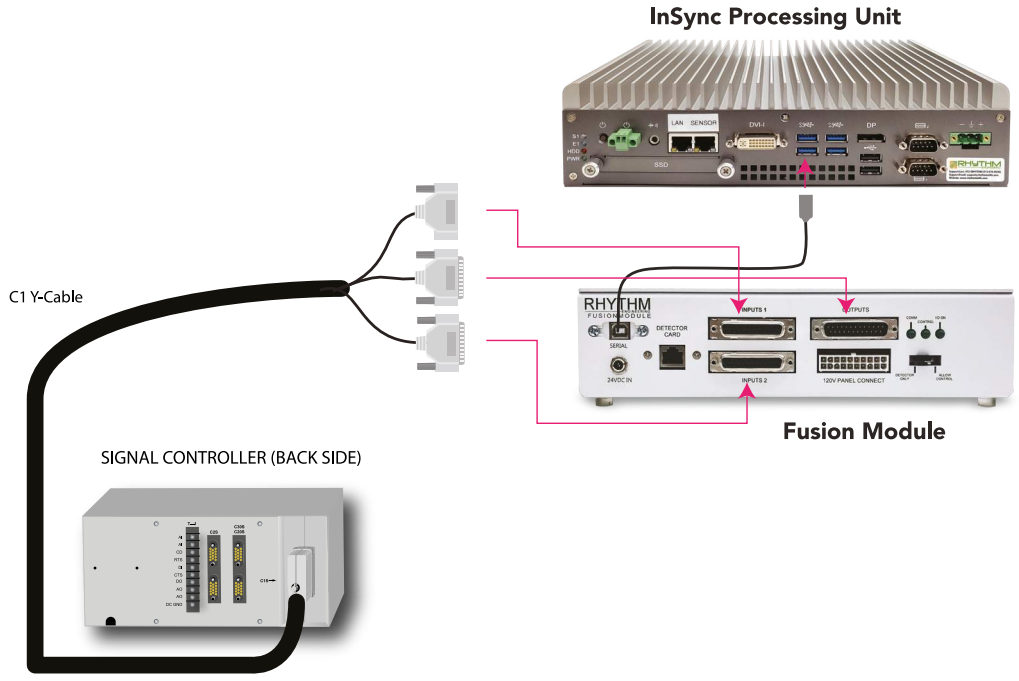


Figure 7-18.2 C1 Y-Cable connections

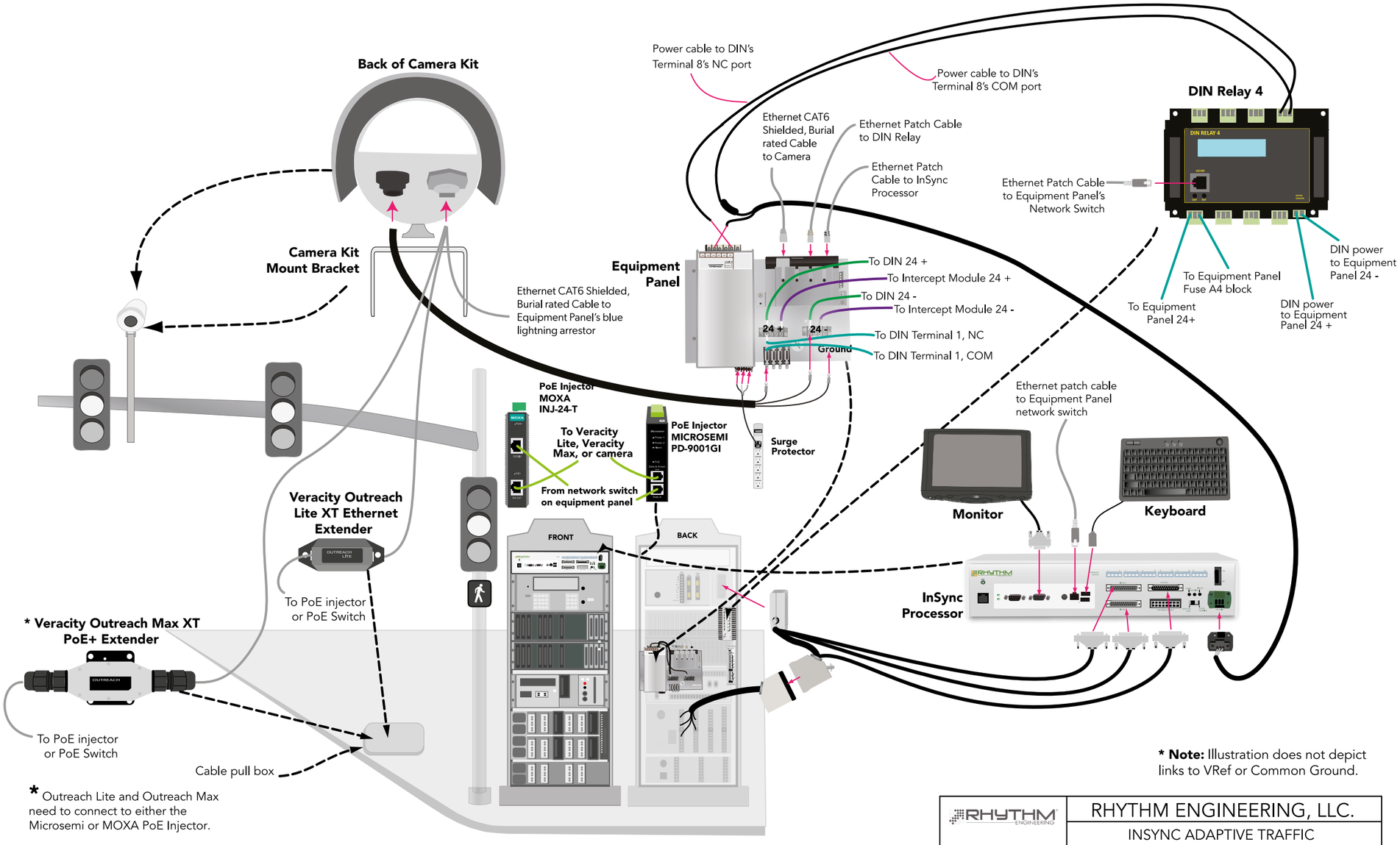
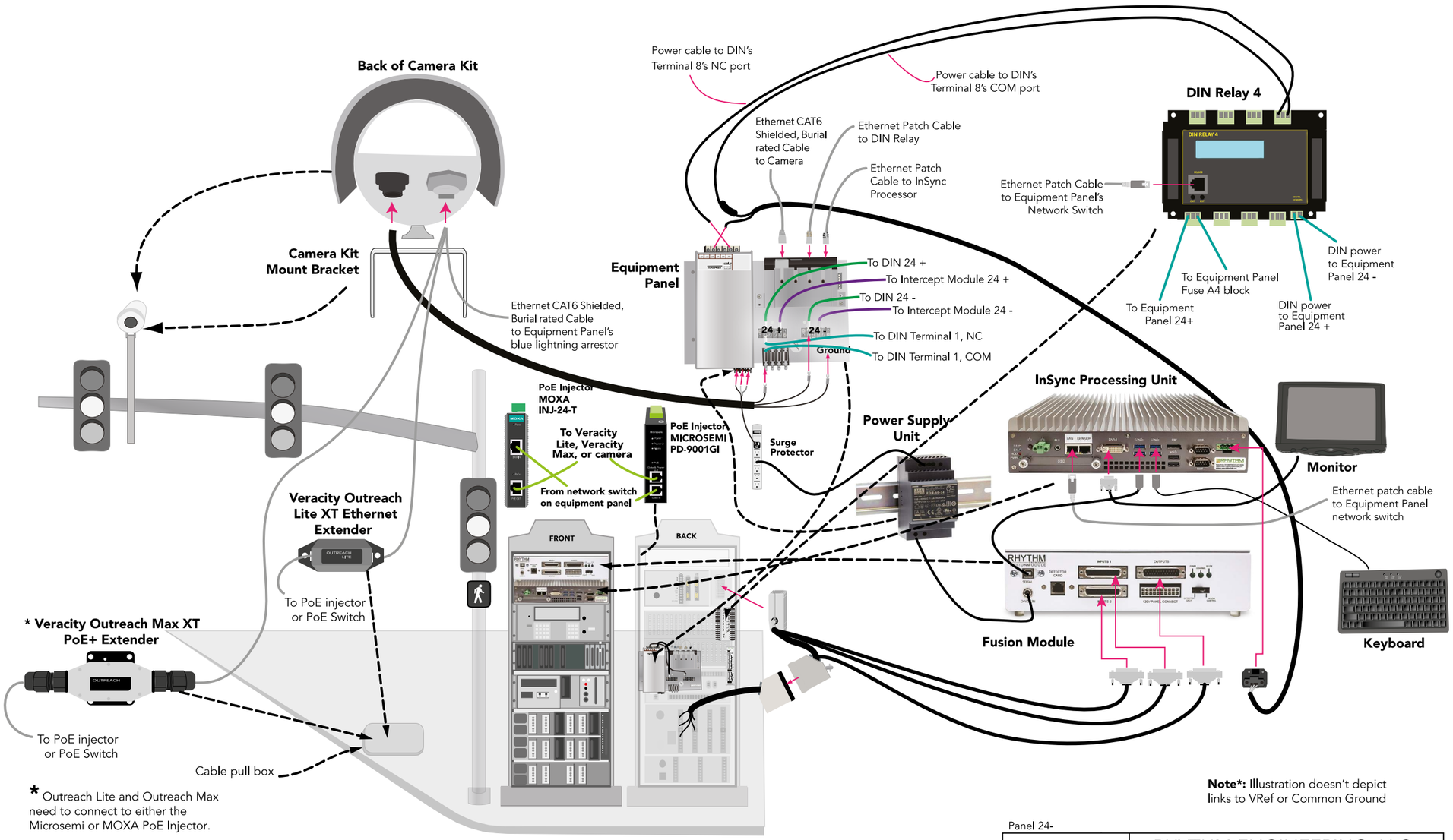
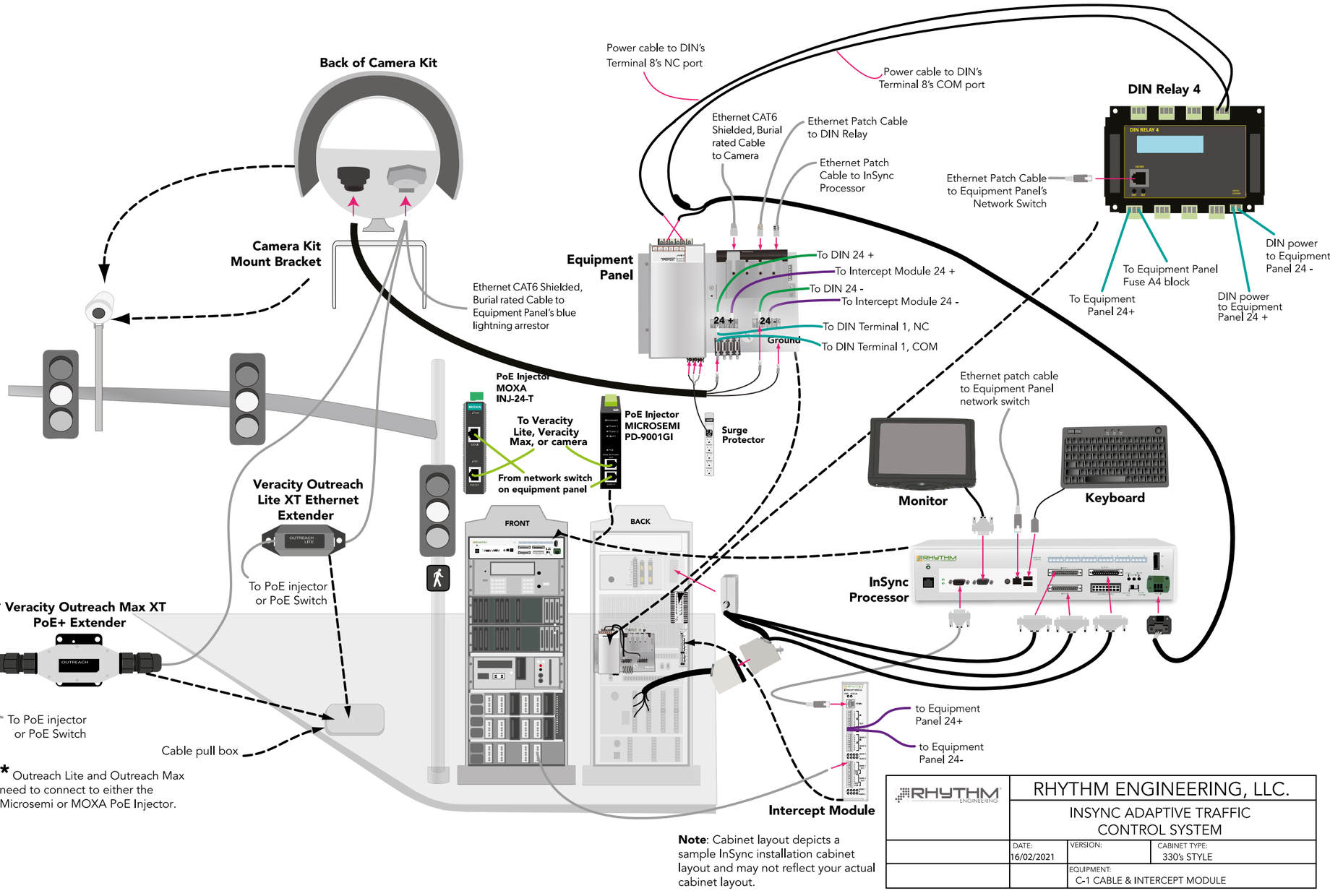


Figure 7-19. C-1 Y-cable equipment connections in an In|Sync/In|Sync:Fusion installation with ET975K Processor



Note: Cabinet layout depicts a sample InSync installation cabinet layout and may not reflect your actual cabinet layout.

Figure 7-19.1 C-1 Y-cable equipment connections in an In|Sync/In|Sync:Fusion installation with Bluefin Processor



* Outreach Lite and Outreach Max need to connect to either the Microsemi or MOXA PoE Injector.

Note: Cabinet layout depicts a sample InSync installation cabinet layout and may not reflect your actual cabinet layout.

RHYTHM ENGINEERING, LLC.			
	INSYNC ADAPTIVE TRAFFIC CONTROL SYSTEM		
	DATE: 16/02/2021	VERSION:	CABINET TYPE: 330's STYLE
		EQUIPMENT: C-1 CABLE & INTERCEPT MODULE	

Figure 7-20. C-1 Y-cable equipment connections with ped interception in an In|Sync/In|Sync:Fusion installation with ET975K Processor

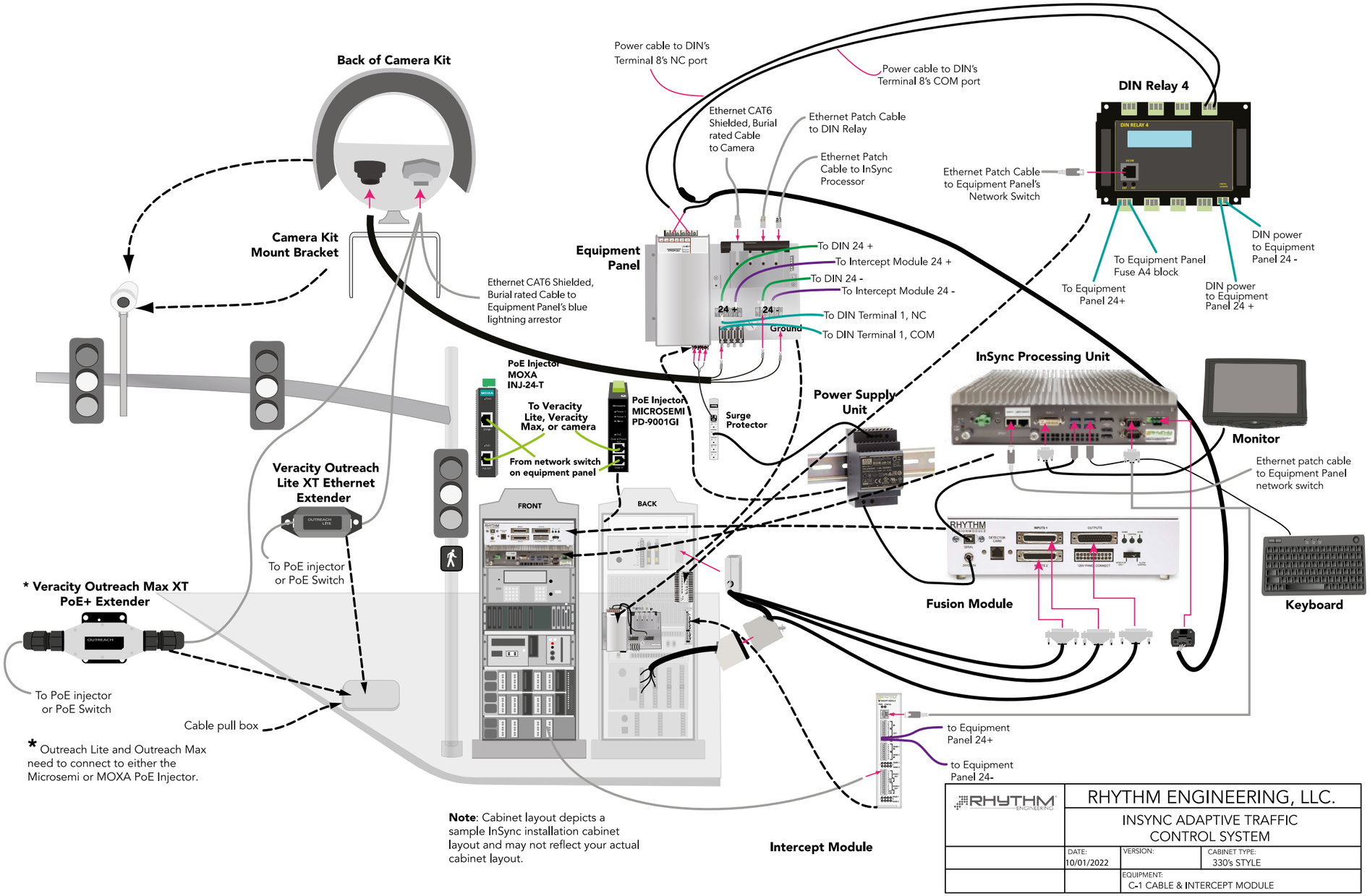


Figure 7-20.1 C-1 Y-cable equipment connections with ped interception in an In|Sync/In|Sync:Fusion installation with Bluefin Processor

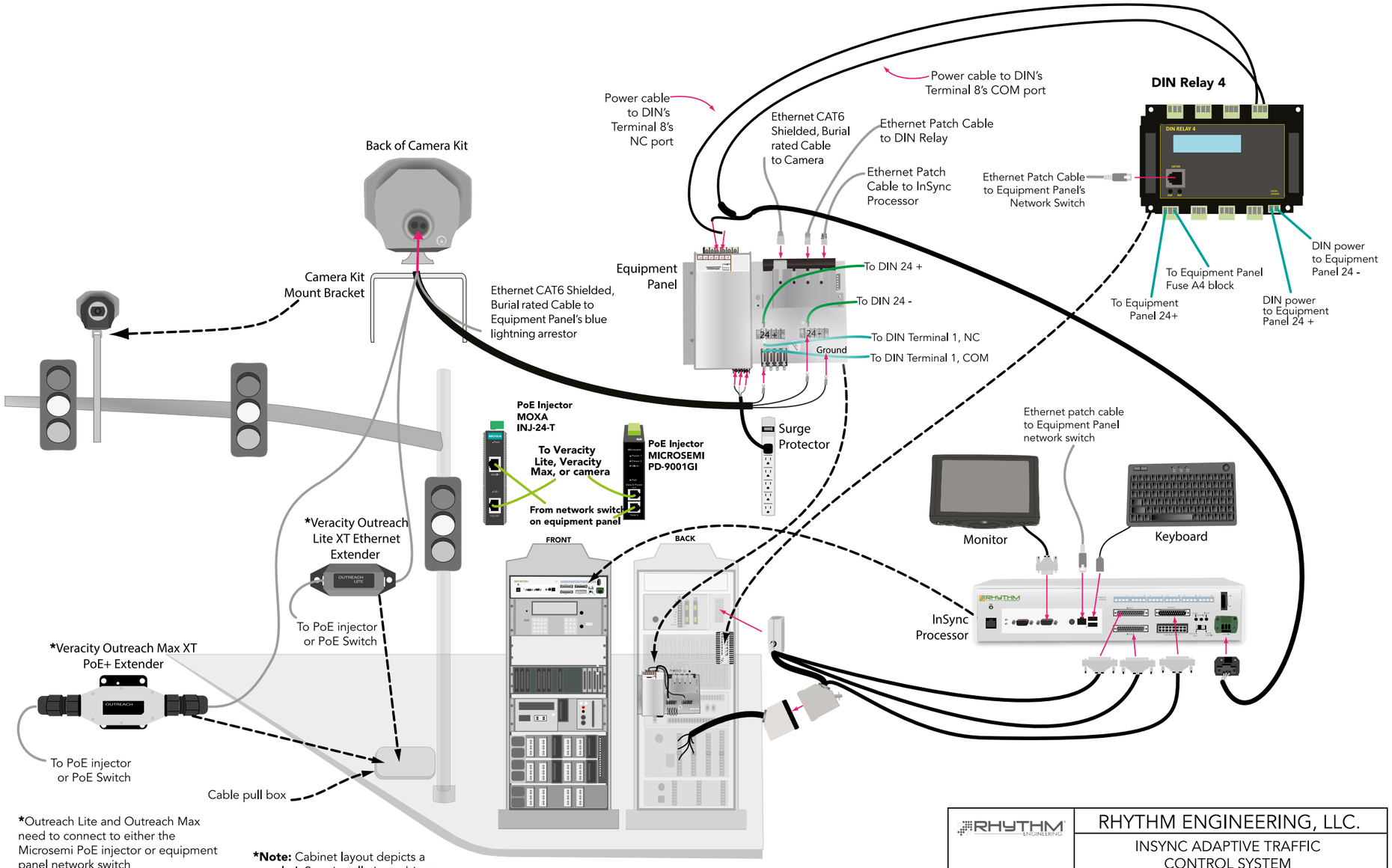


Figure 7-21. C-1 Y-cable equipment connections in an In|Sync:Thermal installation with ET975K Processor

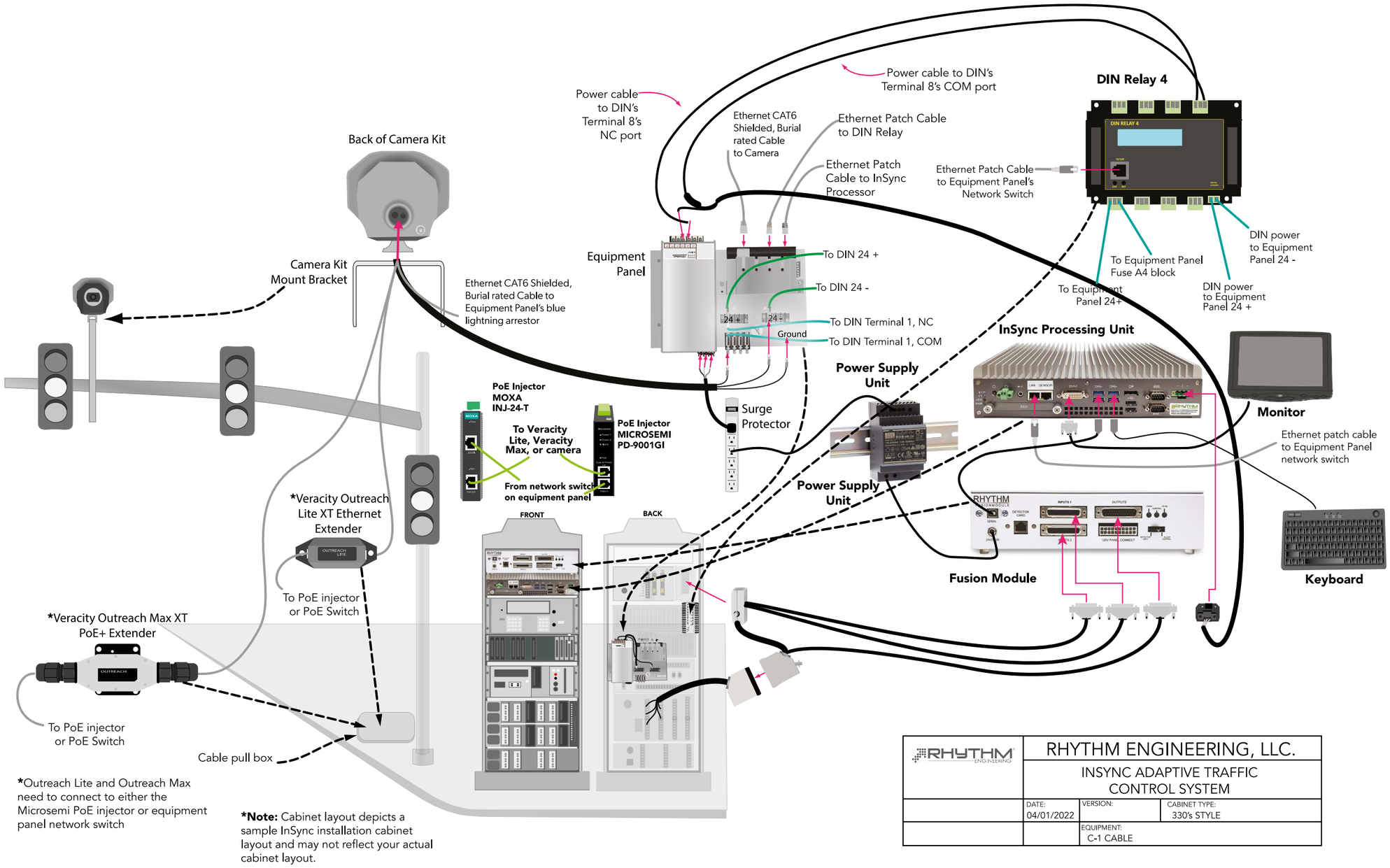


Figure 7-21.1 C-1 Y-cable equipment connections in an In|Sync:Thermal installation with Bluefin Processor

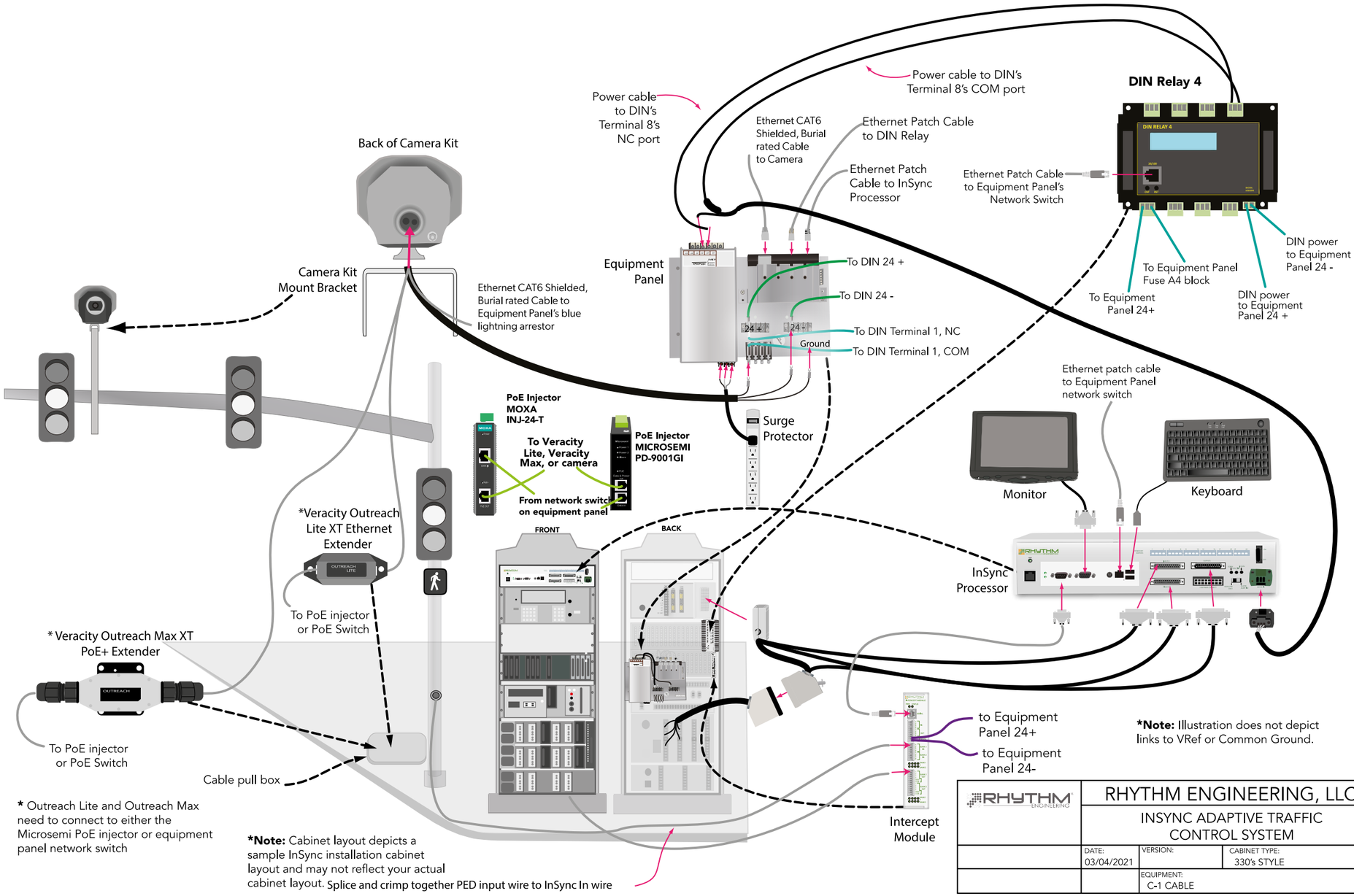


Figure 7-22. C-1 Y-cable equipment connections with ped interception in an In|Sync:Thermal Installation with ET975K Processor

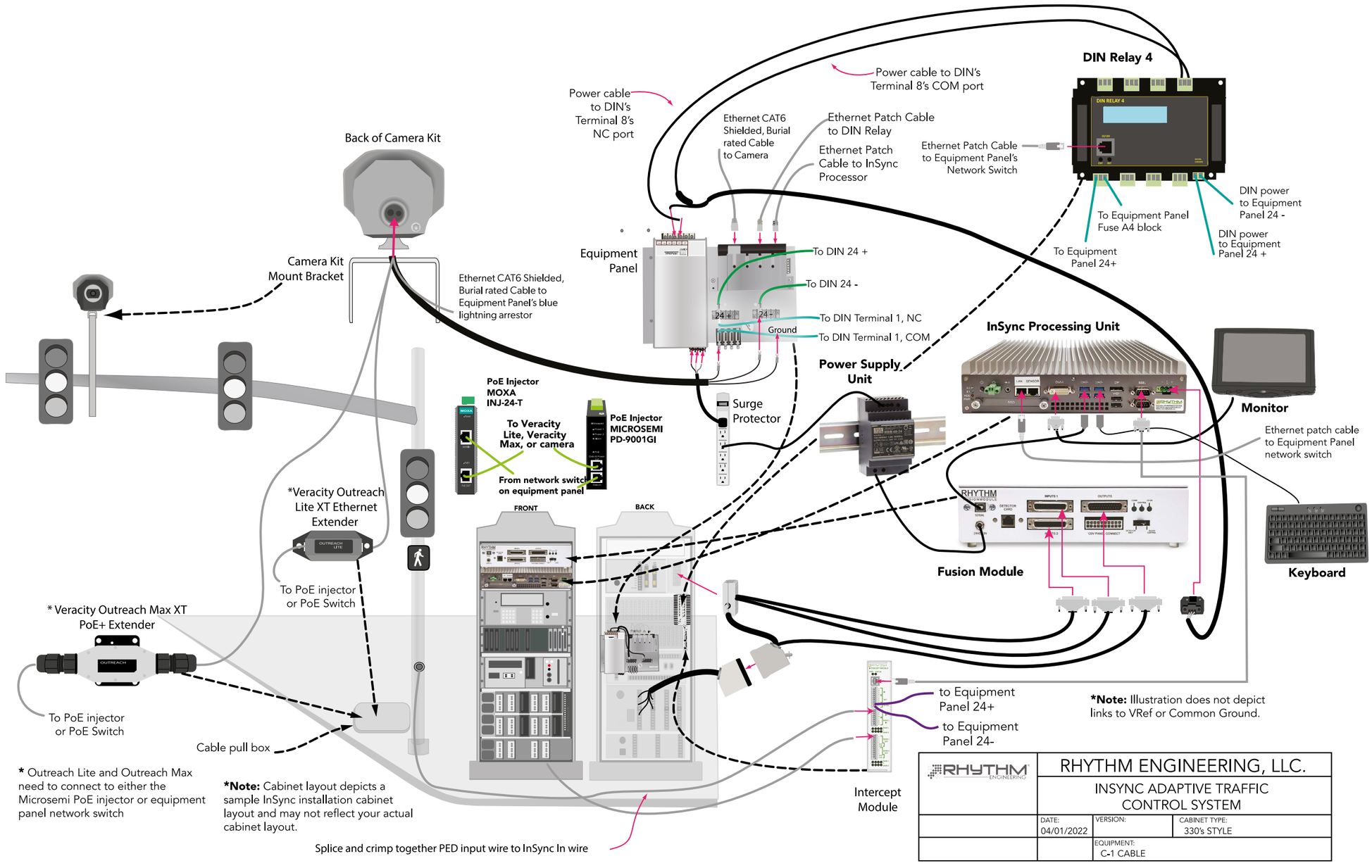


Figure 7-22.1 C-1 Y-cable equipment connections with ped interception in an In|Sync:Thermal Installation with Bluefin Processor

7.8. Connecting via SDLC Intercept ITS Module

7.8.1. Connecting the Hardware

Secure the SIIM in the cabinet

Install the SDLC Intercept ITS Module (SIIM) using a single bracket to the front of the cabinet. Leave room between the module and the rack to allow room for the cables.



Figure 7-23. Connect SDLC ITS Module using a single bracket

Install equipment panel and connect power

1. Install the Equipment Panel at the rear of the cabinet.
2. Plug in the SIIM power supply to the provided power strip or a convenient AC electrical outlet in the cabinet.
3. Connect the barrel connector to the SDLC Module barrel jack.



Figure 7-24. Connect barrel connector to SDLC barrel jack.

Connect the processor to SIIM

1. Connect the DB9 to RJ12 serial cable from the processor's DB9 serial port to the RJ12 serial jack on the SIIM.



Figure 7-25. Connect the processor to the SIIM

2. Disconnect the SDLC Serial bus #1 cable from the back of the Input Assembly where the SDLC terminal for SIU9 (the detector SIU) resides. This will disconnect SIU9 from the main cabinet SDLC Serial bus #1.

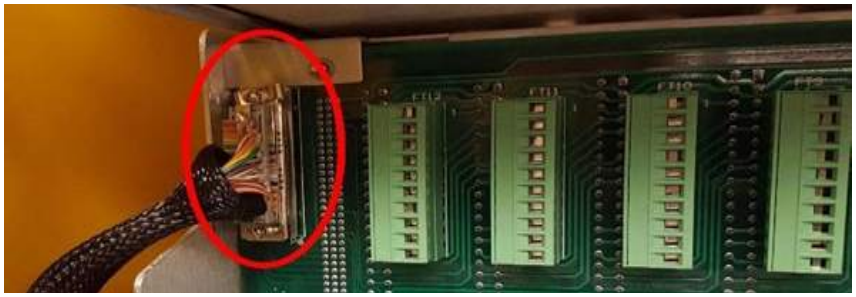


Figure 7-26. Disconnect the SDLC serial bus #1 cable

There are two SDLC Serial bus #1 cables provided for each SIIM.

3. Connect one of the cables to the 25-pin ICP port on the SIIM.
4. Connect the other end of the cable to the back of the Input Assembly where the SDLC terminal for SIU9 (the detector SIU) resides. If there is more than 1 detector SIU being intercepted, make the remaining connections on the rest of the connectors on the cable to the remaining input SIUs.

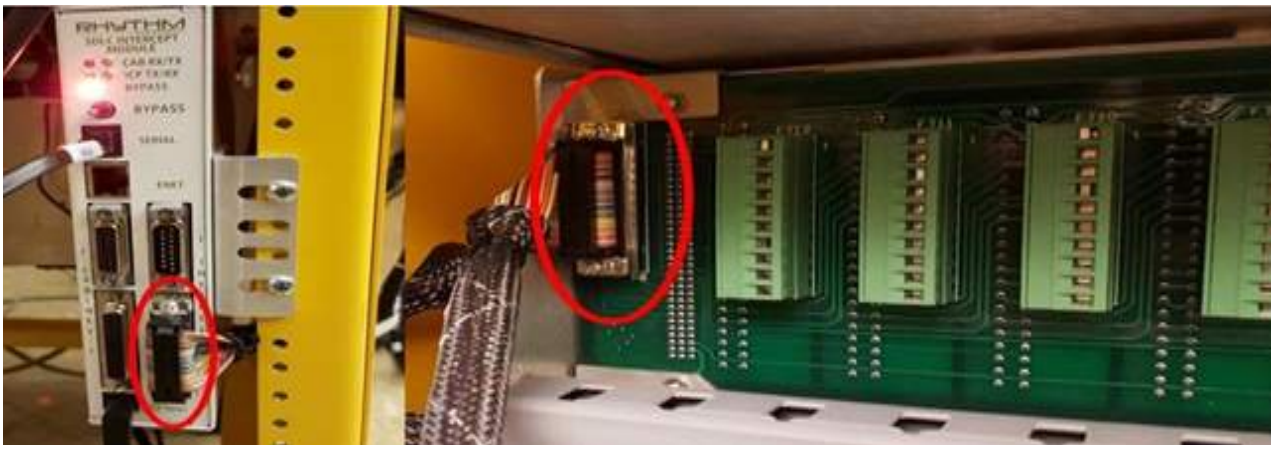


Figure 7-27. Connect the serial bus cable between the 25-pin ICP port and the Input Assembly

5. Connect one of the cables to the 25-pin CAB port on the SIIM. Connect the other end of the cable to one of the available SB #1 ports on the SB #1 Bus Assembly on the back of the cabinet.



Figure 7-28. Connect SIIM's CAB port to SB port on bus assembly

6. Put the SIIM into hardware BYPASS mode using the BYPASS switch, until the SIIM software configuration is completed. The BYPASS LED should remain lit.



Figure 7-29. Turn bypass mode on

7.9. Connecting via SDLC Intercept Module

When connecting to the controller using the SIM (SDLC Intercept Module), you need a serial cable to connect the processor to the SIM, the existing SDLC cable to connect the SIM to the SDLC data bus, and a separate SDLC cable to connect the SIM to the detector rack BIUs.

7.9.1. Connect the Hardware

To connect the SIM between the controller and In|Sync Processor, complete the following steps:

Secure the SIM in the cabinet

Secure the SIM inside the cabinet. It can be rack-mounted in a 330s-style cabinet or placed on a shelf in a NEMA cabinet. Place the SIM near the processor.

> ***Note:*** *The SIM may be mounted on a shelf near the In|Sync Processor with optional screws and bracket.*

Connect the SIM to the processor

Connect the In|Sync Processor to the SIM using the supplied serial cable. The cable connects to the processor's DB9 serial port and the SIM's RJ11 port labeled SERIAL.

Connect power to the SIM

Connect the supplied power cord using the following steps:

1. Plug in the SIM power supply to the provided power strip or a convenient AC electrical outlet in the cabinet.
2. Connect the DC barrel connector on the power supply to the DC IN barrel jack.

Connect the SIM to the detector card rack BIUs

Connect the SIM to the detector card rack using the supplied SDLC cable. This cable connects to the DB15 port labeled INTERCEPT on the SIM and to the DB15 Port1 on the detector rack BIU.

> ***Note:*** *If connecting to additional detector rack BIUs, use our daisy-chain cable to connect to multiple DR BIUs.*

Connect the SIM to the cabinet

Connect the SDLC cable you removed from the detector rack BIU to the SIM DB15 labeled "CABINET."

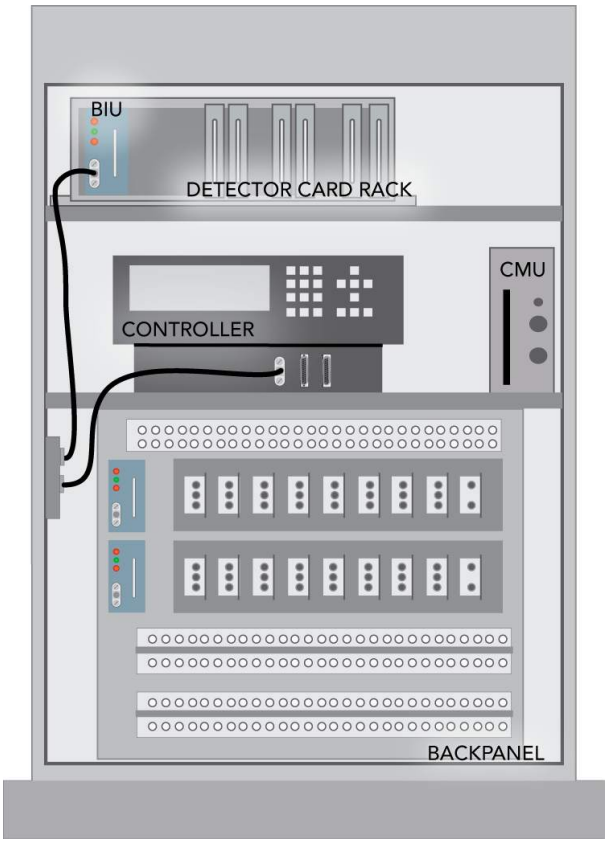


Figure 7-30. Before installing In|Sync

> ***Note:*** *The intercepted SDLC bus cable is available as a daisy chain cable when intercepting multiple detector rack (DR) BIUs.*

If using an ABC or C1 Y-cable or if you are using an SDLC Interface Module, you can use the existing detector cards in the detector rack.

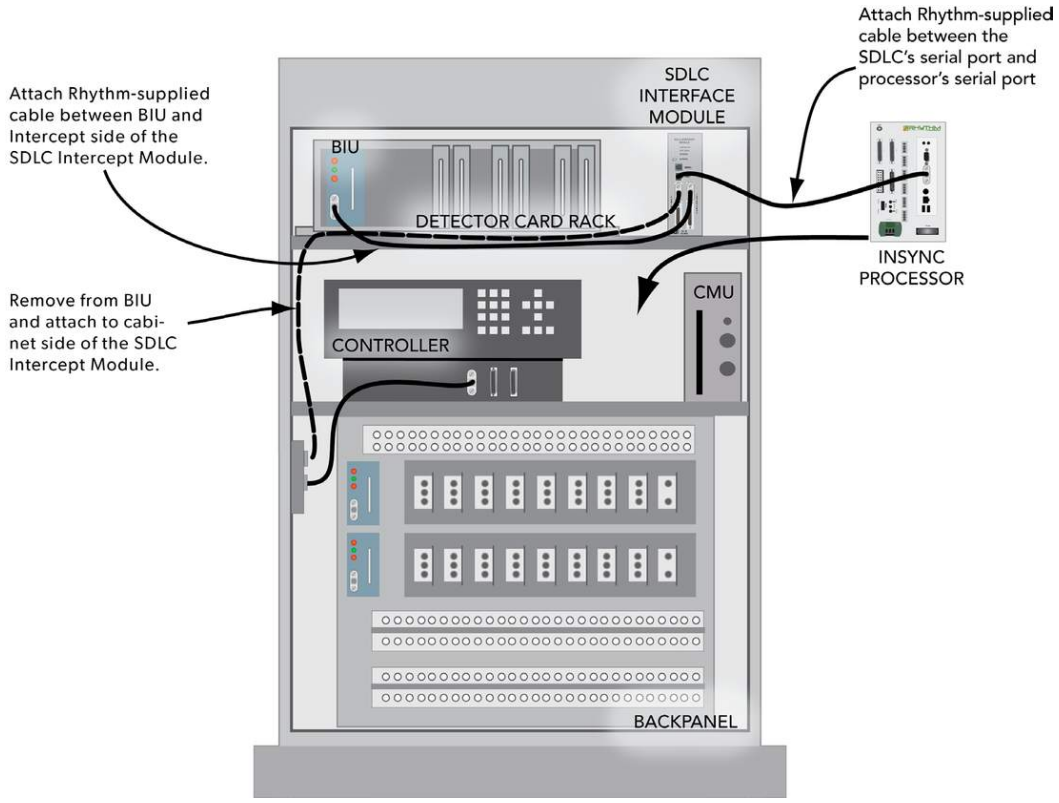


Figure 7-31. After installing In|Sync and the SDLC Intercept Module

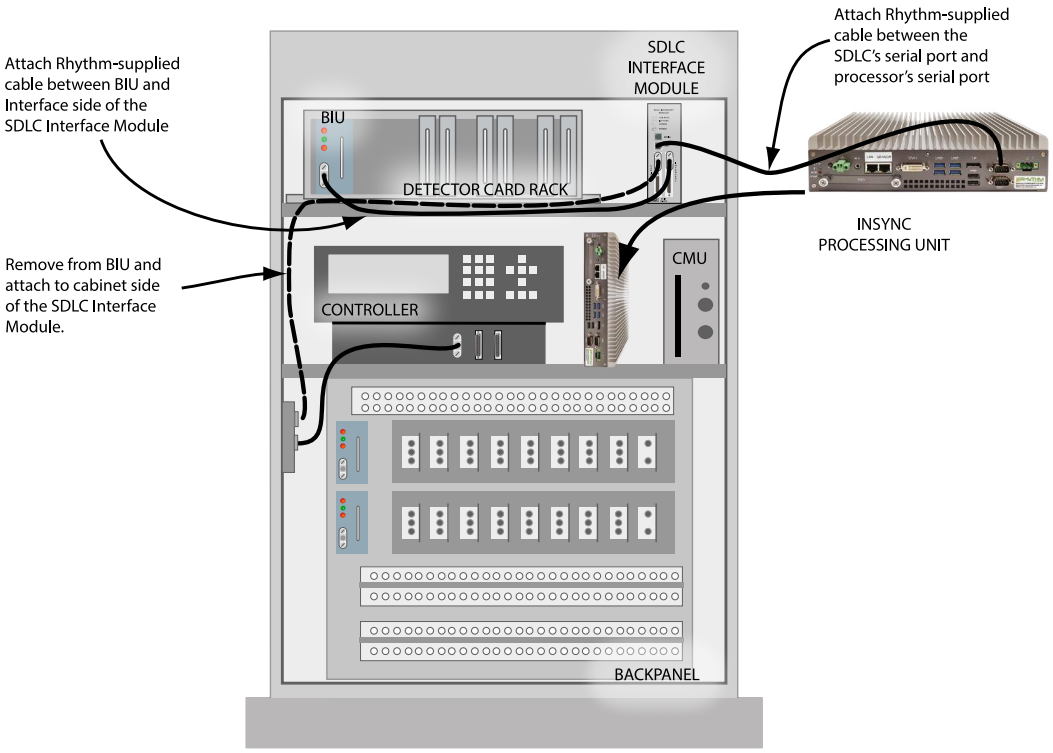


Figure 7-31.1 After installing In|Sync with Bluefin processor, Fusion and SDLC Intercept modules

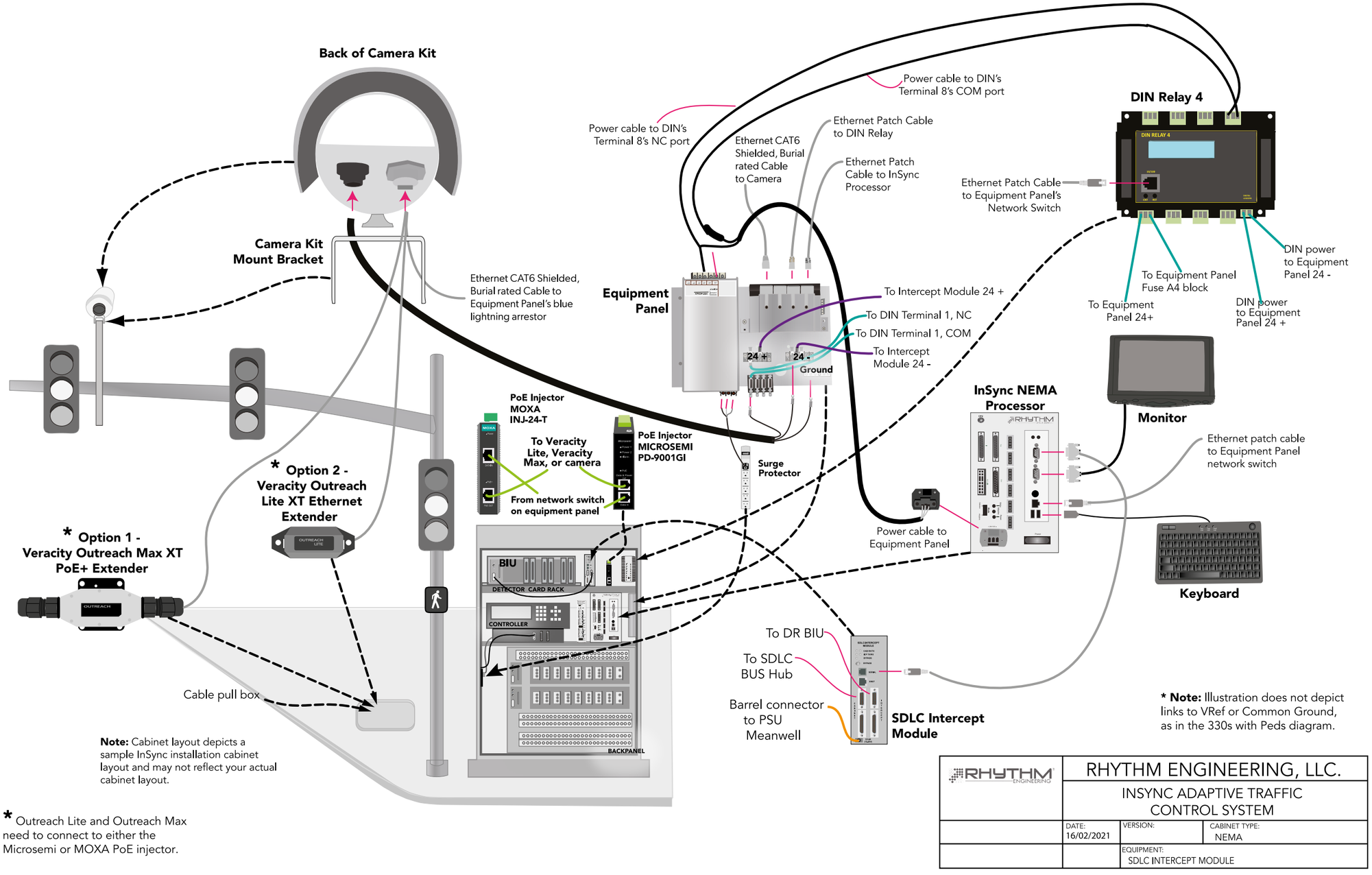


Figure 7-32. In|Sync/In|Sync:Fusion installation using SIM - NEMA TS2 cabinet with ET975K Processor

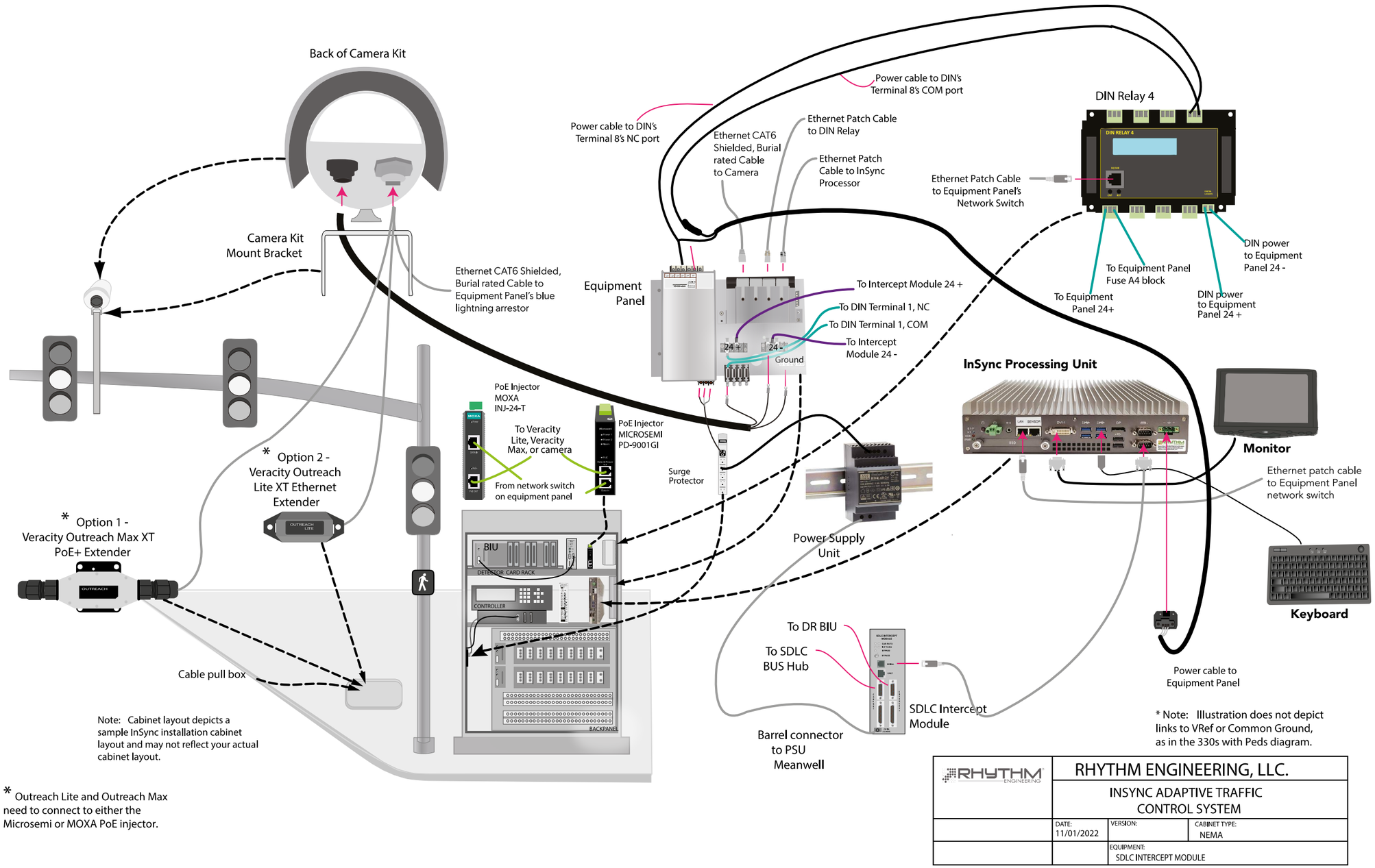


Figure 7-32.1 In|Sync/In|Sync:Fusion installation using SIM - NEMA TS2 cabinet and Bluefin Processor

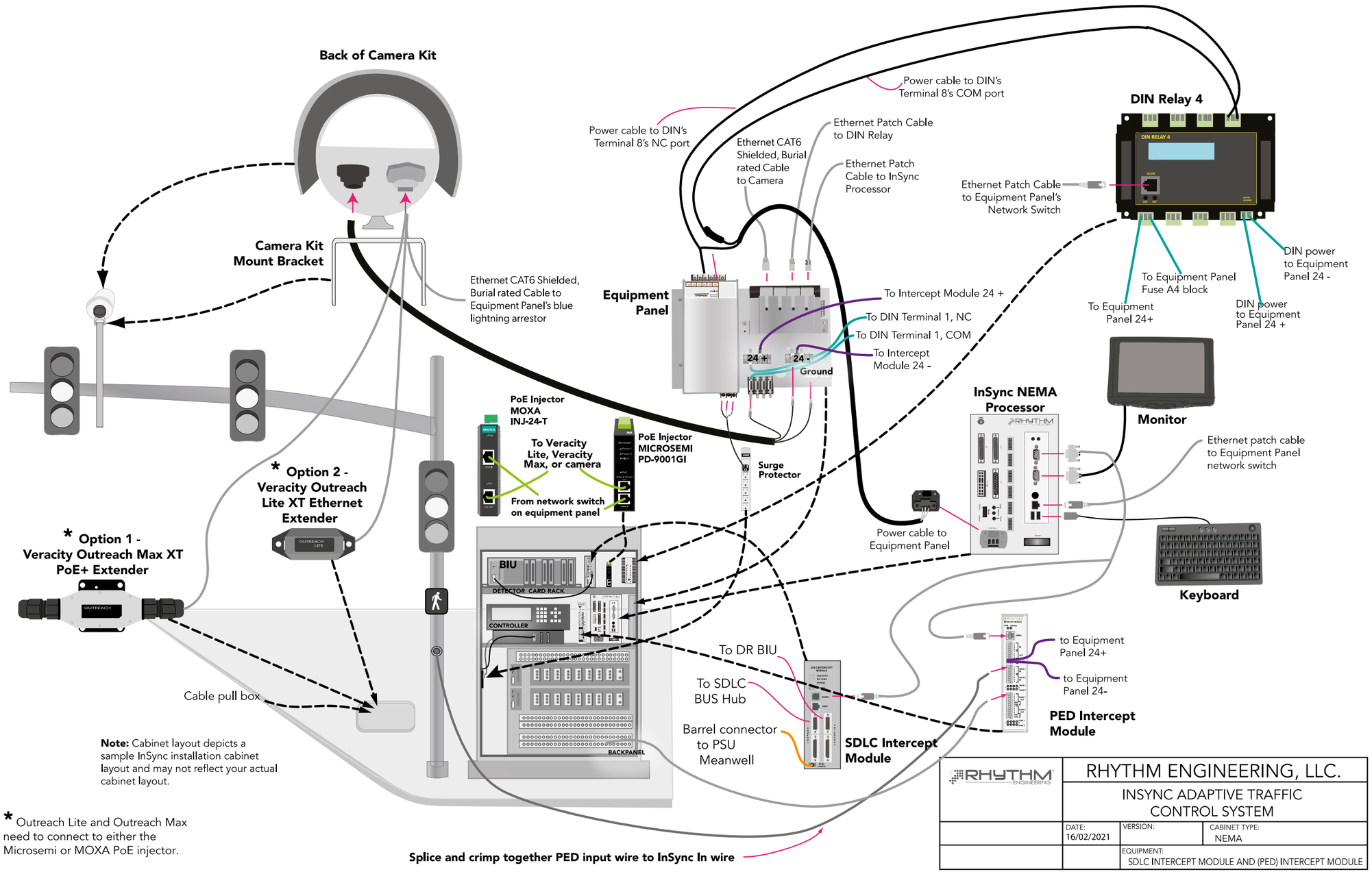


Figure 7-33. In|Sync/In|Sync:Fusion installation using SIM and Intercept Module - NEMA TS2 cabinet with ET975K Processor

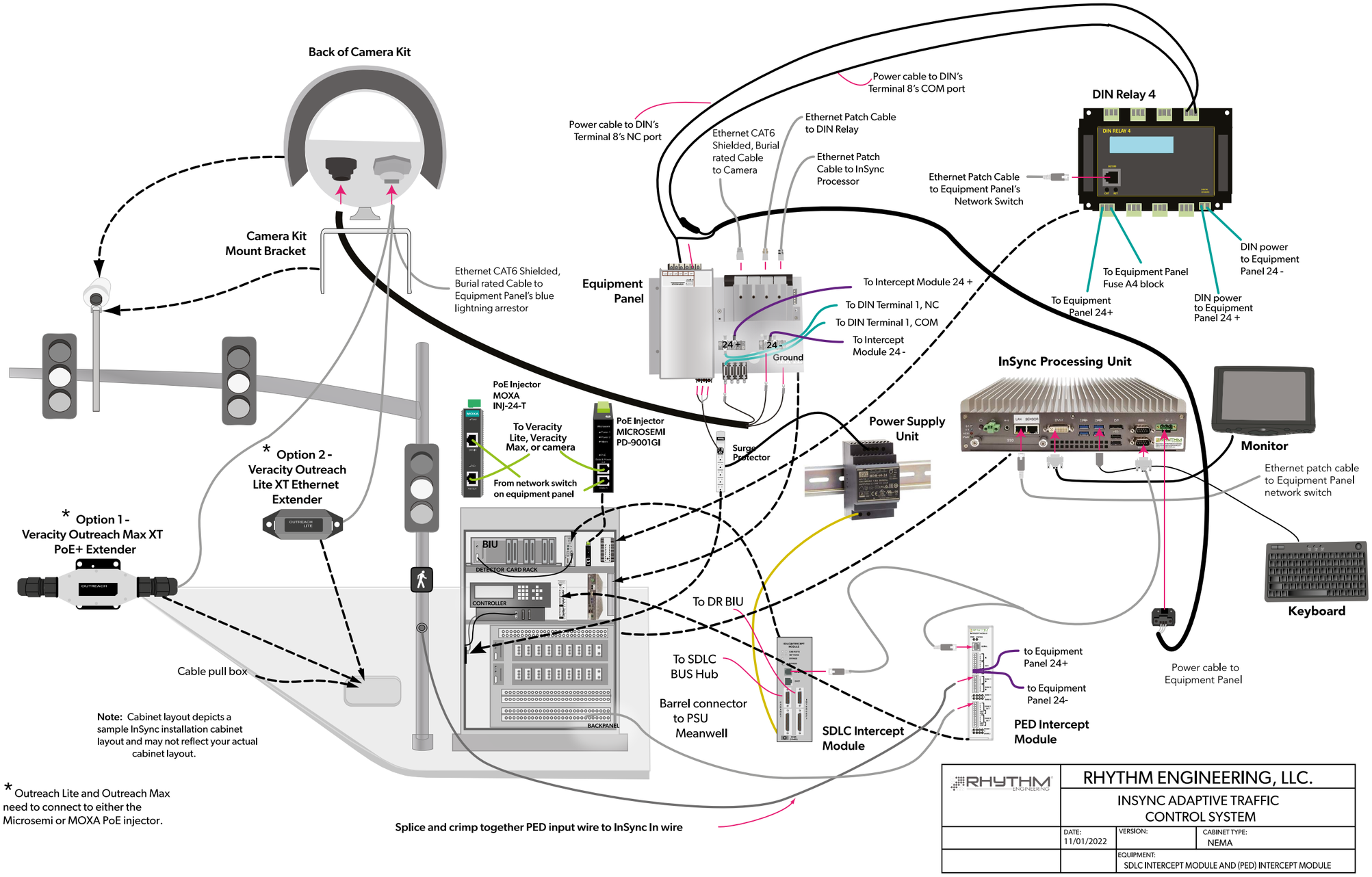


Figure 7-33.1 In|Sync/In|Sync:Fusion installation using SIM and Intercept Module - NEMA TS2 cabinet with Bluefin Processor

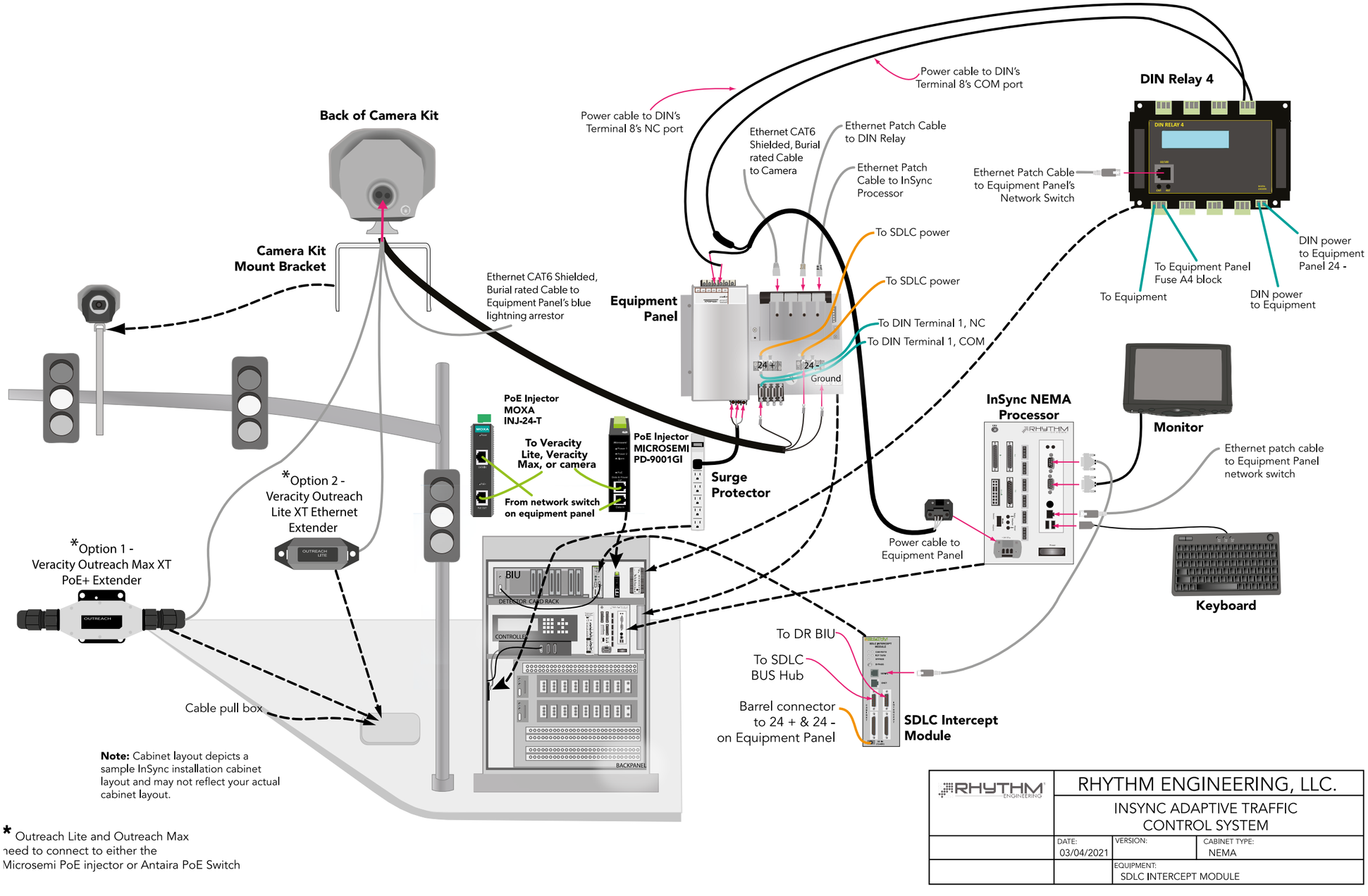


Figure 7-34. In|Sync:Thermal installation using SIM - NEMA TS2 cabinet with ET975K Processor

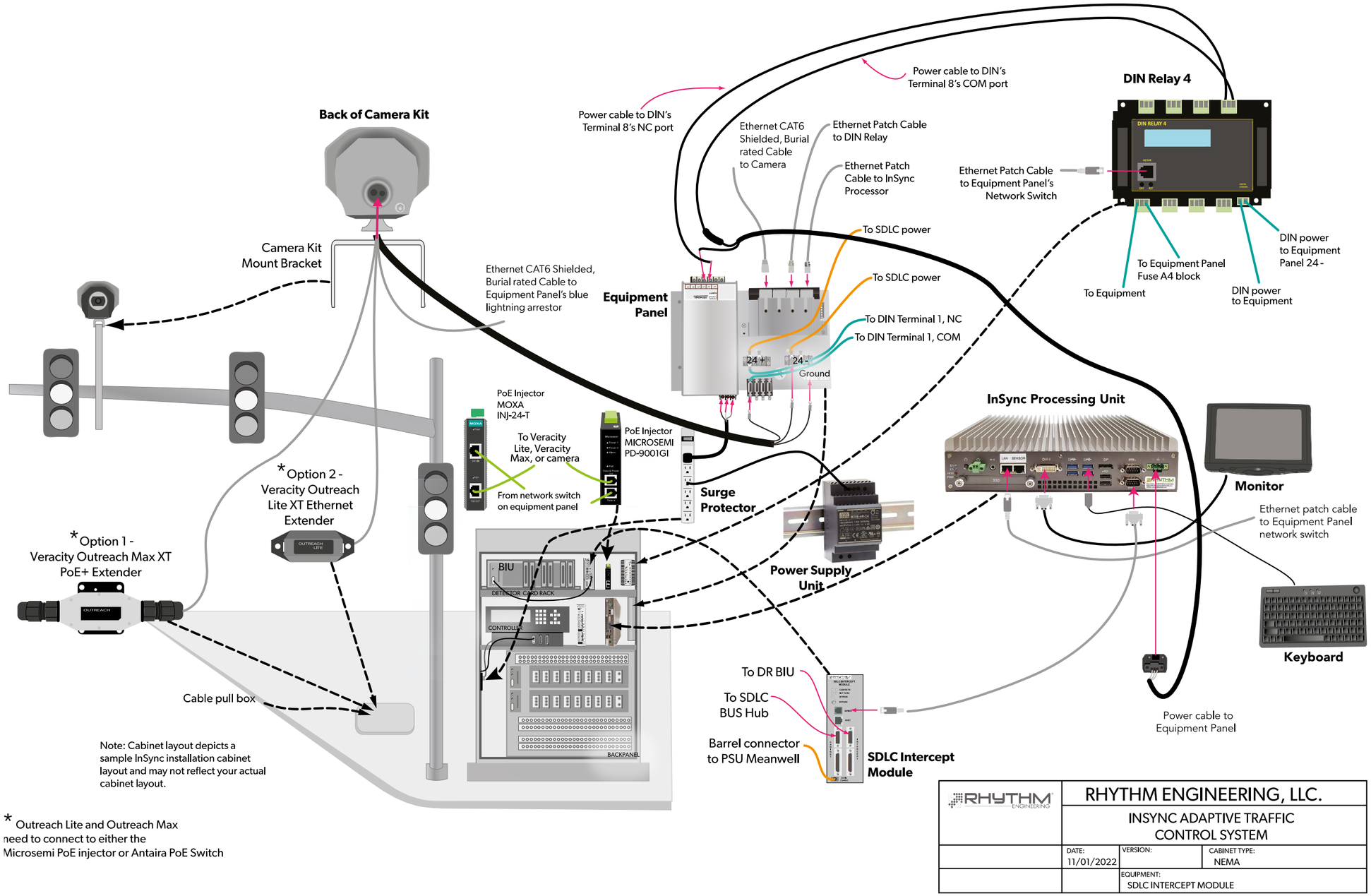


Figure 7-34.1 In|Sync:Thermal installation using SIM - NEMA TS2 cabinet with Bluefin Processor

7.10. Connecting via Detector Cards

When connecting to the controller using detector cards, you will need an RG cable to connect the processor to the output file/traffic controller and new detector cards.

Connecting the processor to the traffic controller is a two-step process: connecting the RG cable to the output file/controller and replacing the detector cards.

7.10.1. Connecting the RG Cable

The RG cable connects the processor to the output panel (330s-style cabinet) or back panel (NEMA cabinet) for picking up the current signal light state (red, yellow, or green). The cable has 18 factory-marked leads with spade connectors, which are used for connecting into the back panel.

Each RG cable lead is labeled. The G1-G8 leads tie into the back panel where power goes out to the green signal light, e.g. G1 on phase 1. It is important to isolate any RG cable ends for unused phases (i.e., secure wires together with electrical tape). Do not attach leads to the back panel if the corresponding phase is not being used.

1. Tie the two leads marked AC– or NEUT to the Neutral bar in traffic cabinet.
2. Write down the phasings for the current configuration in the order that the cycle flows (if it has not been already written down in the cabinet).

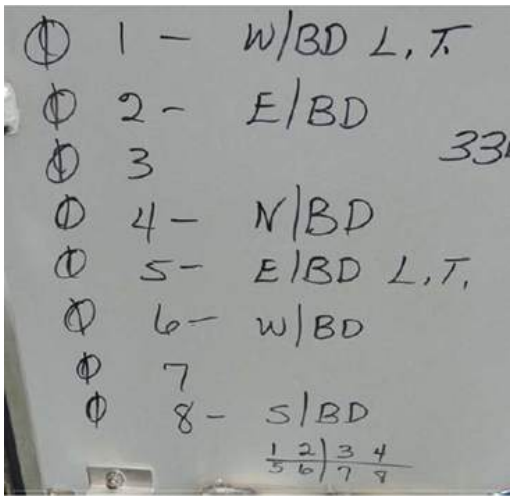


Figure 7-35. Writing down phase mappings

3. Separate and tape any spade connectors on the RG cable that will not be used.



Figure 7-36. G1 lead

4. Connect the wire labeled G1 to the 110V/AC terminal position for Phase 1 green signal heads.
5. Connect the wire labeled G2 to the 110V/AC terminal position for Phase 2 green signal heads.
6. Continue to connect RG cables until all phases are connected.

7.10.2. Determining the Number of Detector Cards Needed for Each Intersection

In|Sync detector cards are 4-channel capable. There are two primary determining factors in identifying how many detector cards will be required for each intersection:

1. **Is the existing detector card rack 2-channel or 4-channel capable?**
    - If the existing detector card rack in a traffic cabinet is 4-channel capable AND the detector assignments are programmed appropriately, it is possible for In|Sync to effectively pass calls to the controller for 8 phases using two detector cards.
    - If the existing detector card rack in a traffic cabinet is only 2-channel capable, a minimum of four detector cards is required to pass calls to the controller for eight phases.
2. **How many phases are in use at each intersection?**
    - Not every intersection uses 8 phases, so the number of cards required at each intersection is also determined by the number of phases in use.

EXAMPLES: (SLOT AND PHASING ASSIGNMENTS ARE FOR EXAMPLE PURPOSES ONLY)

Intersection A: Four-channel capable detector card rack, running all eight phases.

1. **IF the detector assignments are programmed appropriately** in the controller, it is possible to pass calls to the controller for all eight phases using only two detector cards in the following manner:
    a. SLOT 2: CH-1/Phase 3, CH-2/Phase 4, CH-3/Phase 1, CH-4/Phase 2
    b. SLOT 4: CH-1/Phase 7, CH-2/Phase 8, CH-3/Phase 5, CH-4/Phase 6
2. **IF the detector assignments are not programmed to allow all eight phases** to be reached in two slots:
    a. The detector assignments need to be reprogrammed to allow all eight phases to be reached in two slots as demonstrated previously,

OR

    b. More detector cards are required to effectively pass calls to the controller for all eight phases.

Intersection B: Four-channel capable detector card rack, running only four phases.

1. **IF the detector assignments are programmed appropriately** in the controller, it is possible to pass calls to the controller for all four phases using only one detector card in the following manner:
    a. SLOT 1: CH-1/Phase 1, CH-2/Phase 2, CH-3/Phase 3, CH-4/Phase 4
2. **IF the detector assignments are not programmed to allow all four phases** to be reached in one slot:
    a. The detector assignments need to be reprogrammed to allow all four phases to be reached in one slot as demonstrated above,

OR

    b. More detector cards are required to effectively pass calls to the controller for all four phases.

Intersection C: Two-channel capable detector card rack, running all eight phases.

1. **IF the detector assignments are programmed appropriately** in the controller, it is possible to pass calls to the controller for all eight phases using just four detector cards in the following manner:
    a. SLOT 1: CH-1/Phase 1, CH-2/Phase 2, CH-3/OFF, CH-4/OFF
    b. SLOT 2: CH-1/Phase 3, CH-2/Phase 4, CH-3/OFF, CH-4/OFF
    c. SLOT 3: CH-1/Phase 5, CH-2/Phase 6, CH-3/OFF, CH-4/OFF
    d. SLOT 4: CH-1/Phase 7, CH-2/Phase 8, CH-3/OFF, CH-4/OFF
2. **IF the detector assignments are not programmed to allow all eight phases** to be reached in four slots:
    a. The detector assignments need to be reprogrammed to allow all eight phases to be reached in four slots as demonstrated above,

OR

    b. More detector cards are required to effectively pass calls to the controller for all eight phases.

Intersection D: Two-channel capable detector card rack, running six phases.

1. **IF the detector assignments are programmed appropriately** in the controller, it is possible to pass calls to the controller for all six phases using just three detector cards in the following manner:
    a. SLOT1: CH-1/Phase 3, CH-2/Phase 4, CH-3/OFF, CH-4/OFF
    b. SLOT 2: CH-1/Phase 1, CH-2/Phase 2, CH-3/OFF, CH-4/OFF
    c. SLOT 4: CH-1/Phase 5, CH-2/Phase 6, CH-3/OFF, CH-4/OFF
2. **IF the detector assignments are not programmed to allow all six phases** to be reached in three slots:
    a. The detector assignments need to be reprogrammed to allow all six phases to be reached in three slots as demonstrated above,

OR

b. More detector cards are required to effectively pass calls to the controller for all six phases.

7.10.3. Installing Detector Cards

The In|Sync detector cards are designed to plug into a standard detector card rack. Each card can generate two or four calls, depending on the rack type. After determining which slots are used to place calls to the signal controller, follow these steps:

1. Set the DIP switches for each channel to associate the channel with the appropriate phase. Figure 8-27 shows the standard settings. Unused channels must have all DIP switches flipped down.

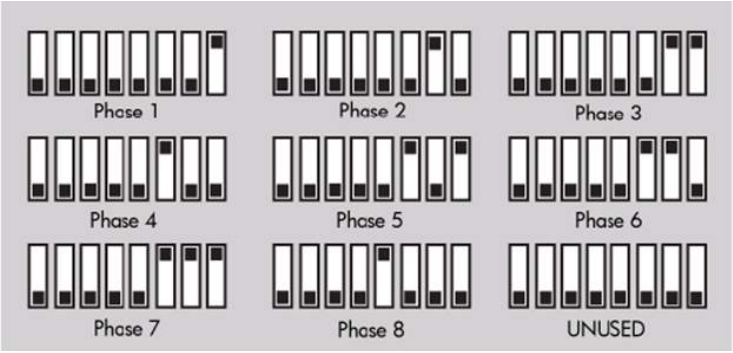


Figure 7-37. DIP switch settings

2. Write the phase in the white area next to the channel indicator light using a marker.
3. Slide the card into the detector rack, pressing firmly. You will know that it is in place when the Status light flashes green and the active channel lights turn solid green. You should also see a call on the controller for the selected phase(s).
4. Run a standard Ethernet patch cable from the port on the In|Sync Processor labeled "Detector Card" to the port labeled "From IO Board or Det Card" (INPUT) on one of the detector cards. In Figure 8-28, this is the yellow patch cord.
5. Run a standard Ethernet cable from the "To Det Card" (OUTPUT) port on that first detector card to the next detector card's "From IO Board or Det Card" (INPUT) port. Continue daisy chaining until all cards are connected. The "To Det Card" (OUTPUT) port on the last card remains empty.

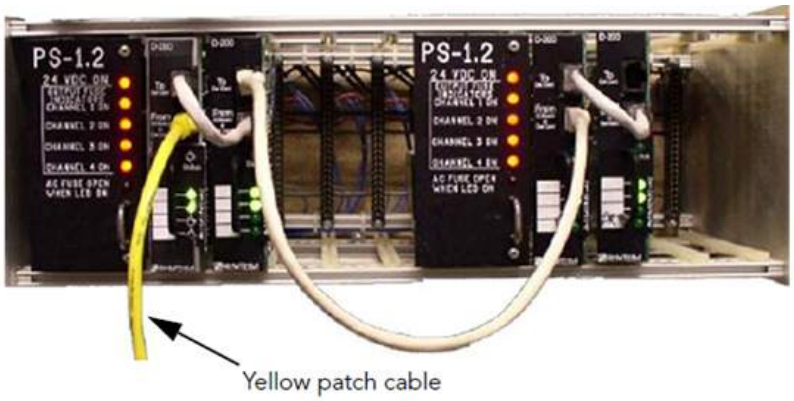


Figure 7-38. Daisy chain configuration

Once the In|Sync Processor is active, the Status light on each card stops flashing and turns solid green.

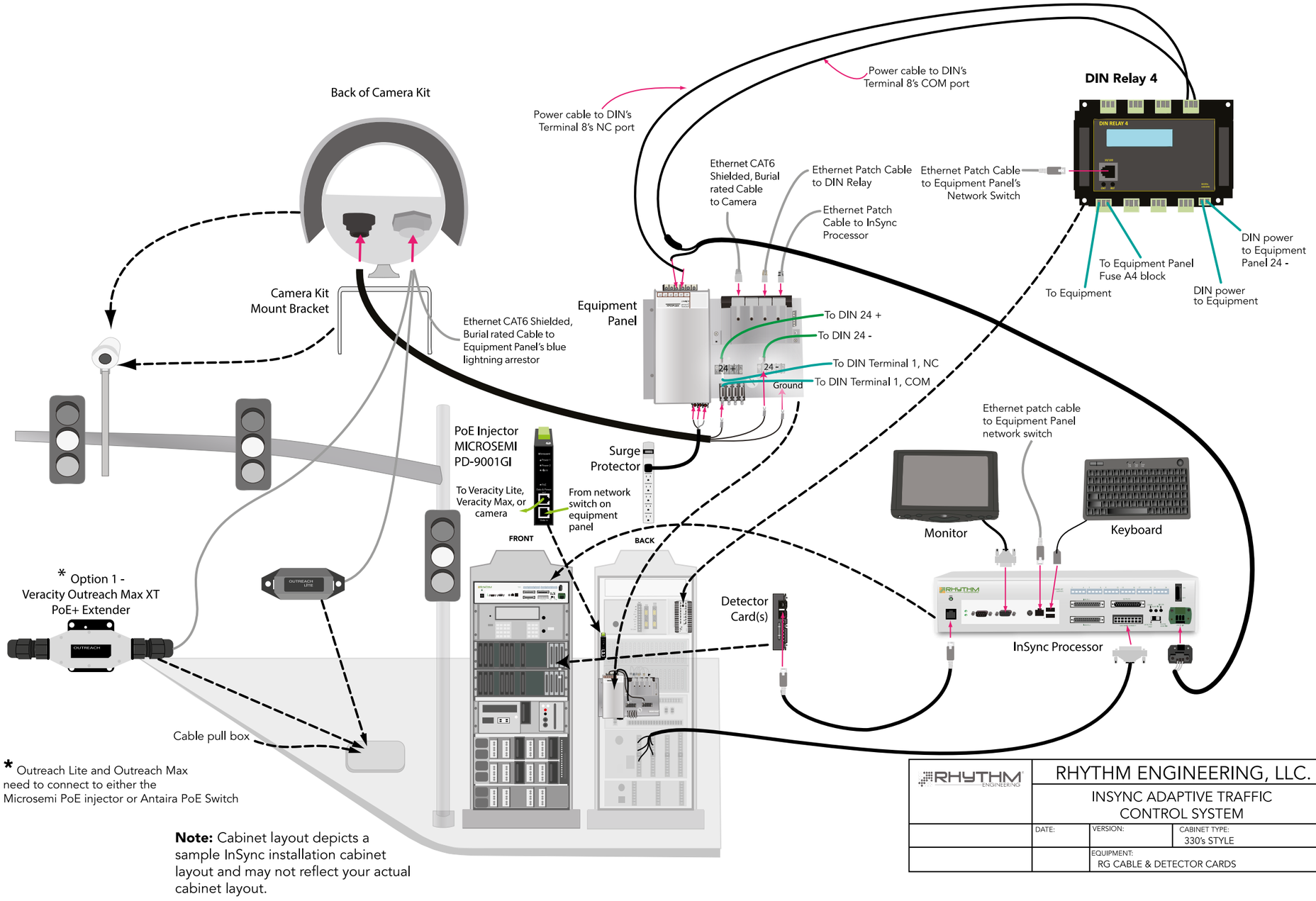


Figure 7-39. In|Sync installation using detector cards - 330's-style cabinet with ET975K Processor

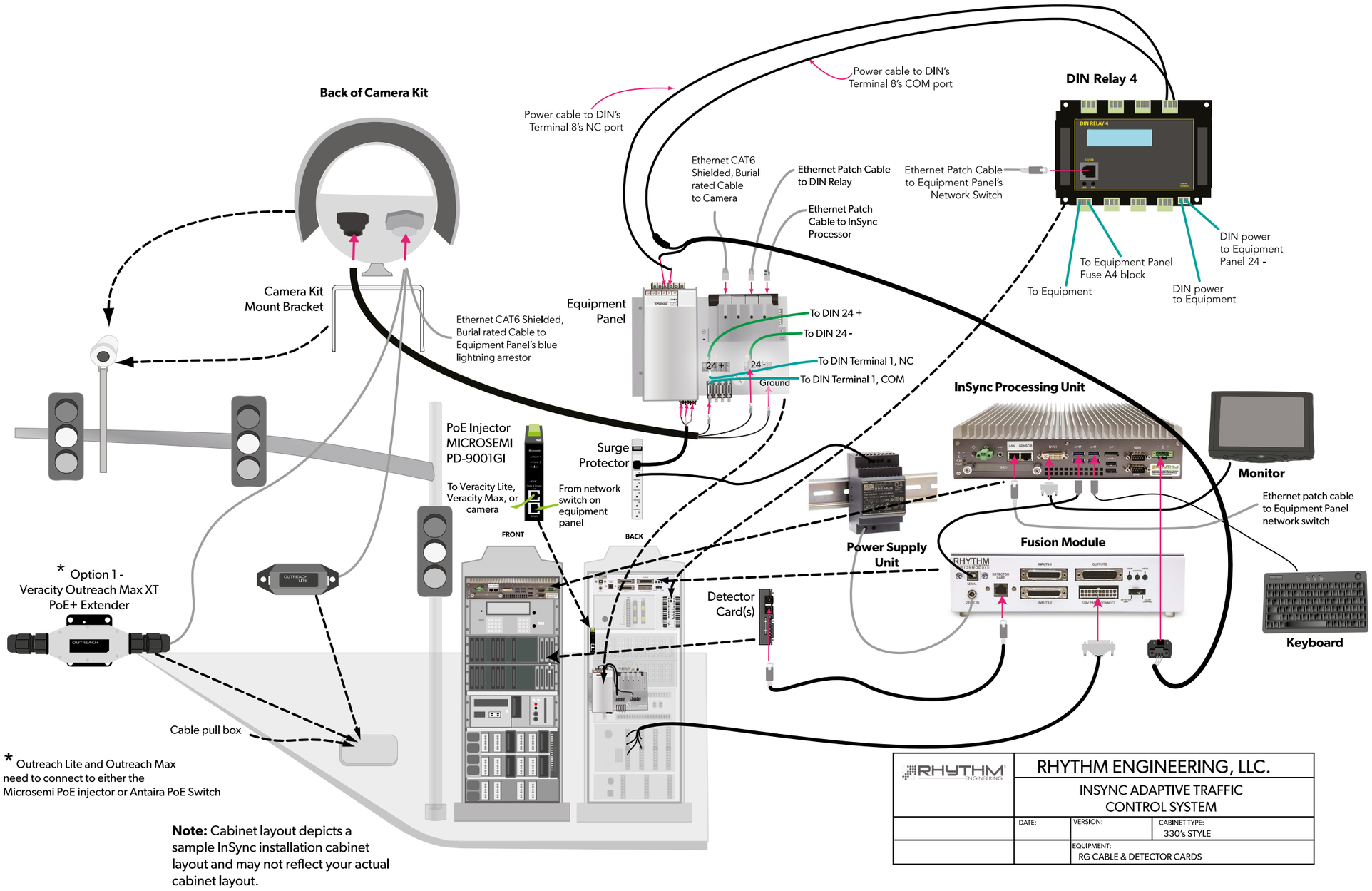


Figure 7-39.1 In|Sync installation using detector cards - 330's-style cabinet with Bluefin Processor

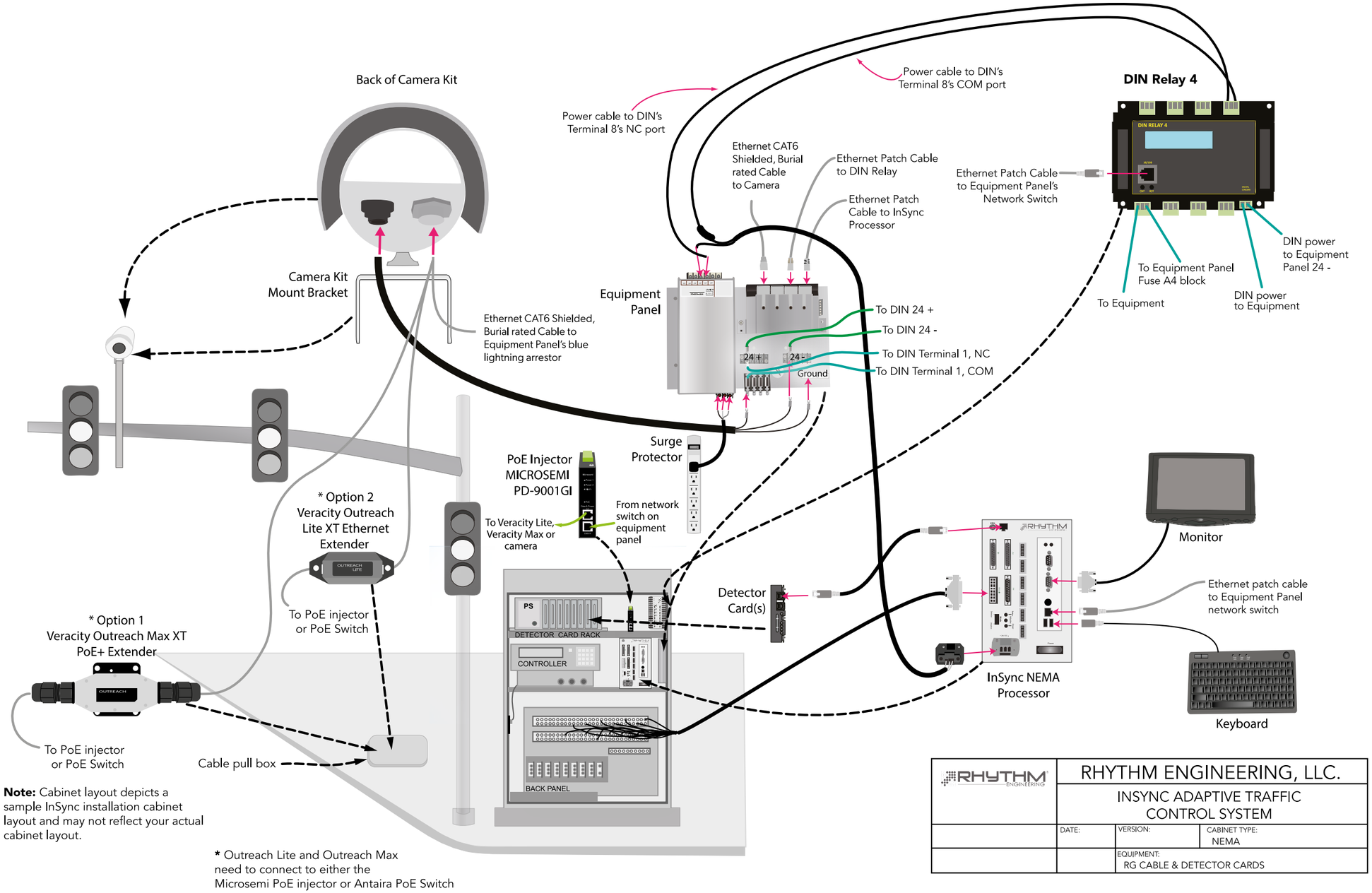
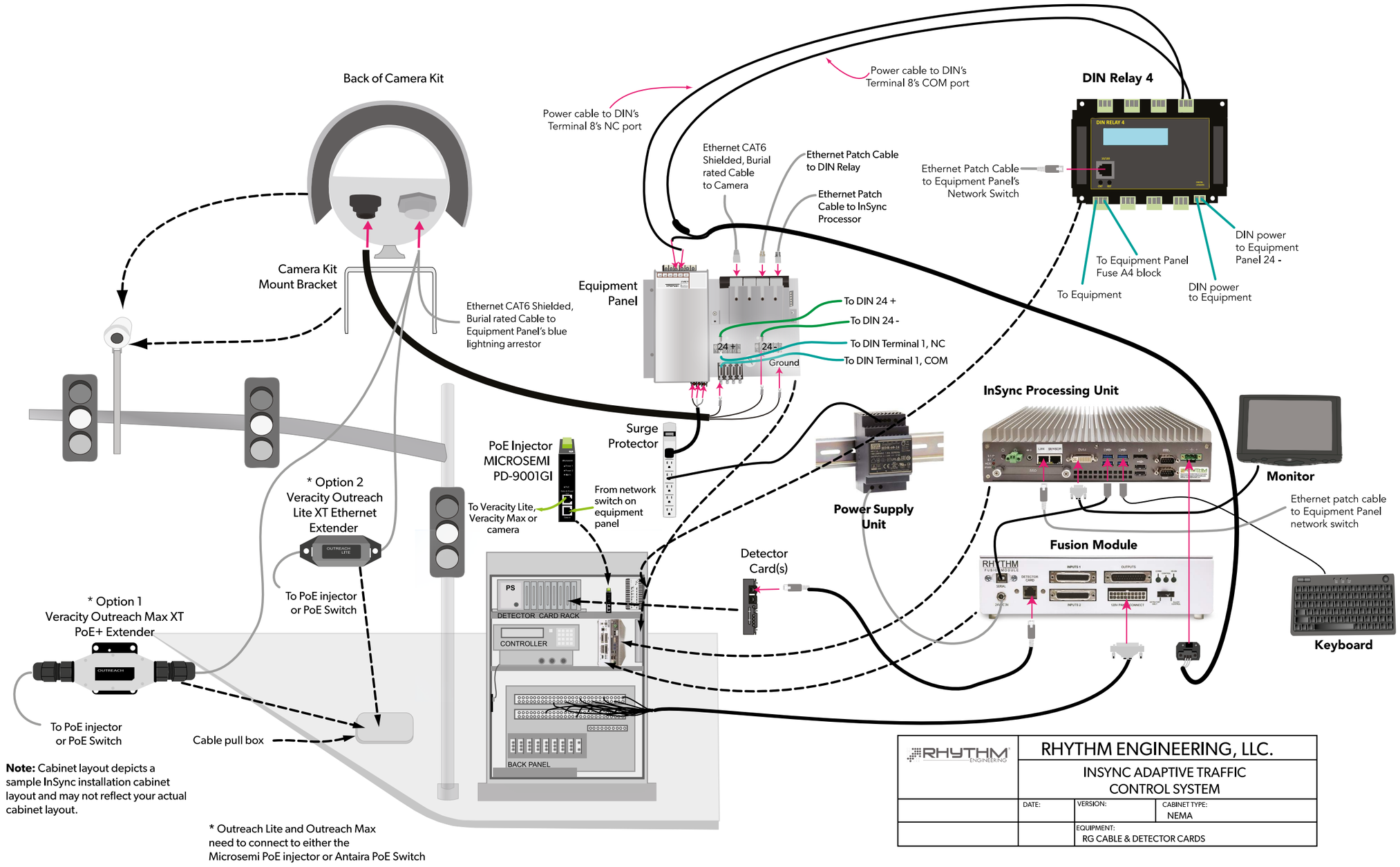


Figure 7-40. In|Sync installation using detector cards - NEMA cabinet with ET975K Processor



Note: Cabinet layout depicts a sample InSync installation cabinet layout and may not reflect your actual cabinet layout.

* Outreach Lite and Outreach Max need to connect to either the Microsemi PoE injector or Antaira PoE Switch

Figure 7-40.1 In|Sync installation using detector cards - NEMA cabinet with Bluefin Processor

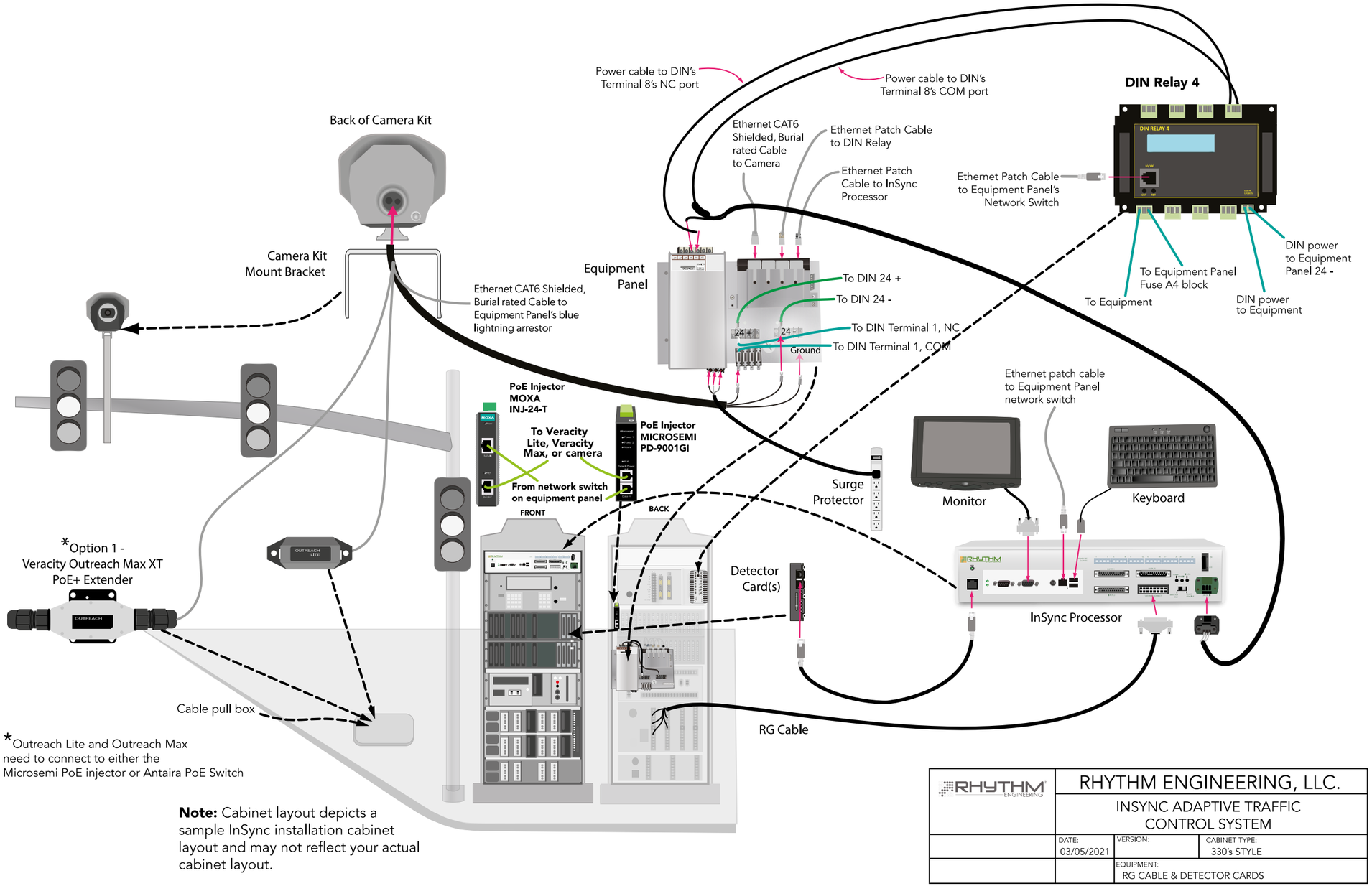


Figure 7-41. In|Sync:Thermal installation using detector cards - 330's-style cabinet with ET975K processor

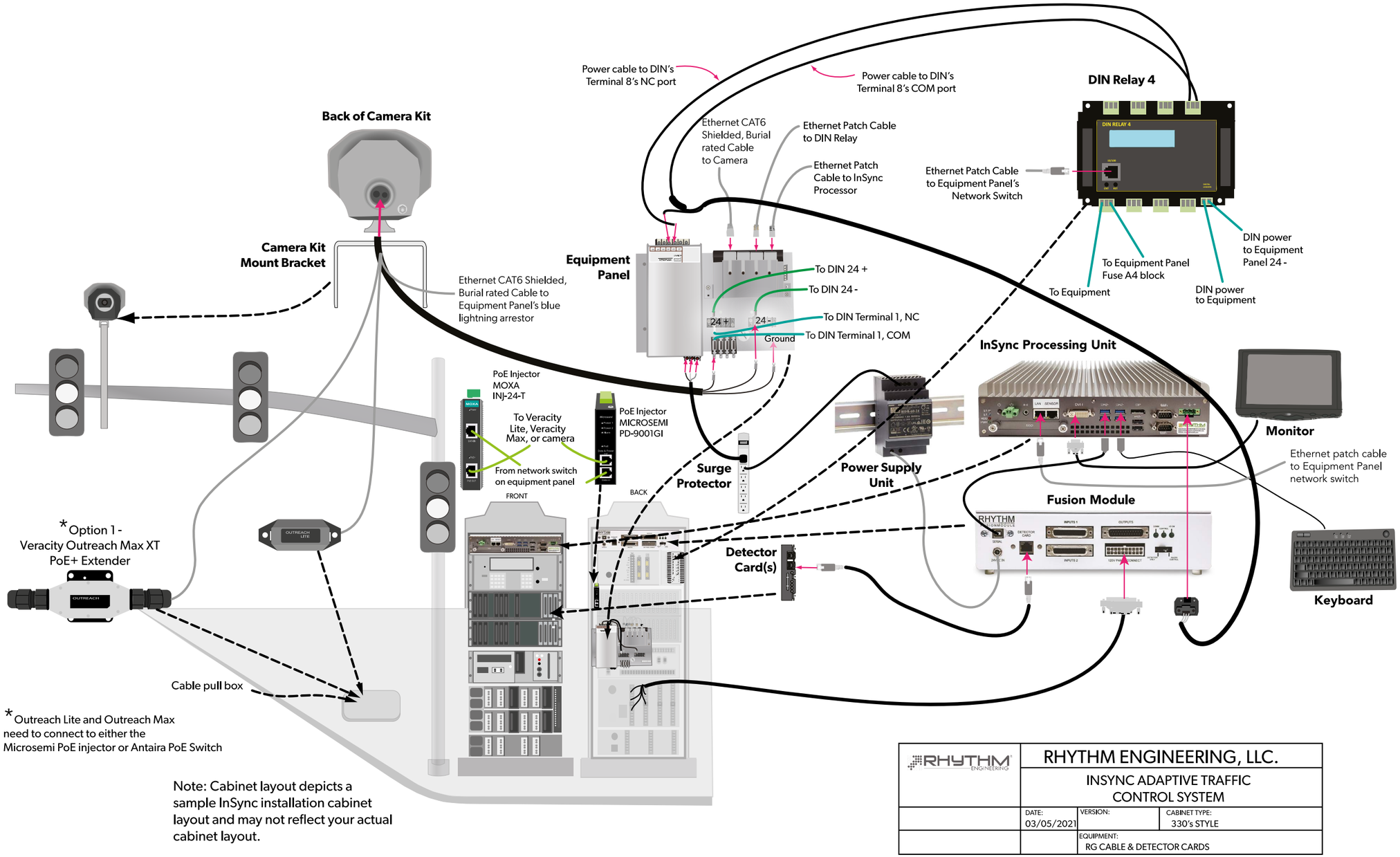


Figure 7-41.1 In|Sync:Thermal installation using detector cards - 330's-style cabinet with Bluefin Processor

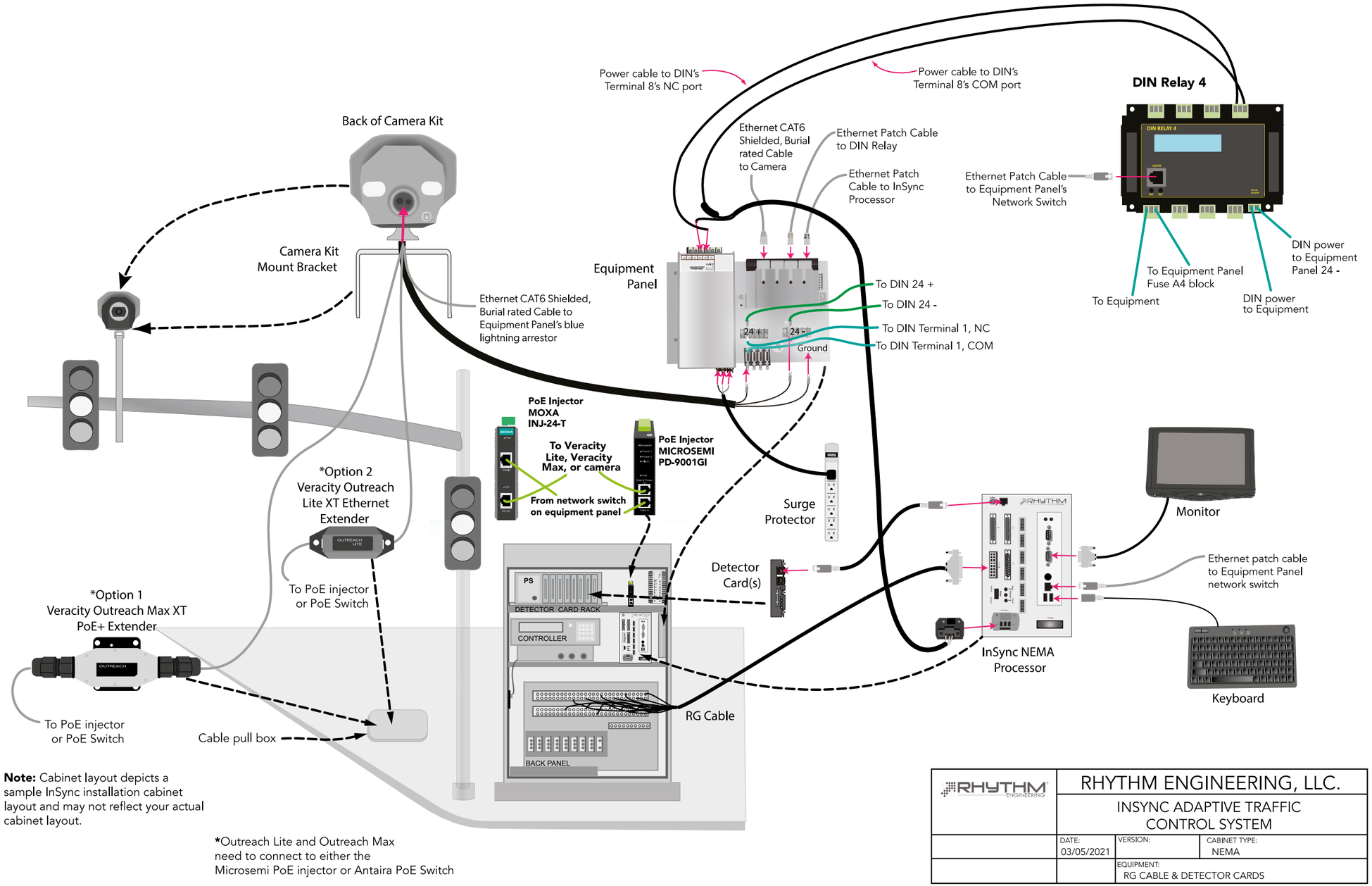


Figure 7-42. Processor In|Sync:Thermal installation using detector cards - NEMA cabinet with ET975K Processor

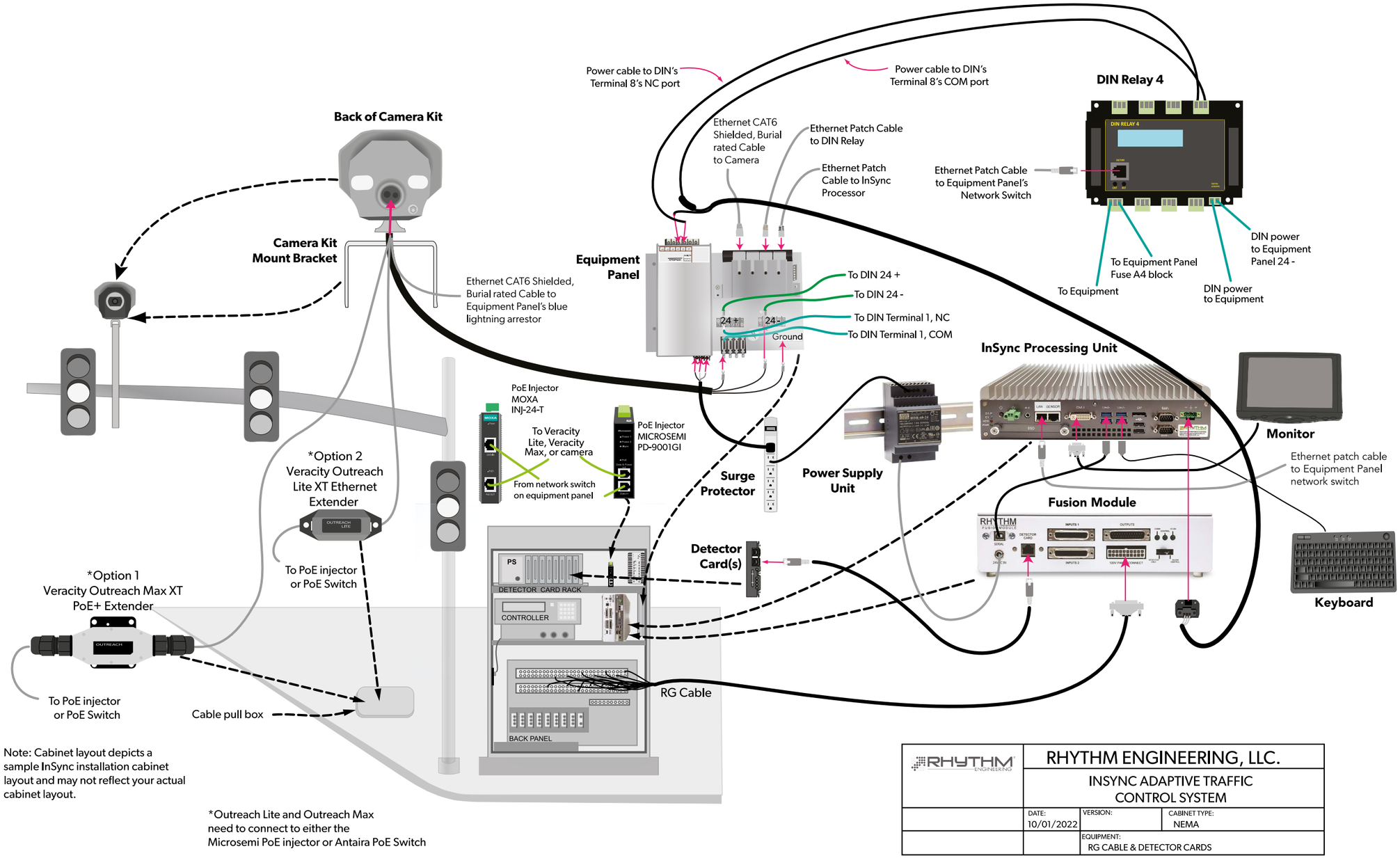


Figure 7-42.1 Processor In|Sync:Thermal installation using detector cards - NEMA cabinet with Bluefin Processor

7.11. I/O Assignment Configuration

7.11.1. Configure detectors at the intersection

Prior to configuring the I/O assignments, you must configure the detector details at the intersection. This ensures that phases and external detectors are created and can be used for I/O assignment.

To do this, select Configure Detectors from the Kiosk's Home page. Follow the directions for configuring an intersection in section 7.2.

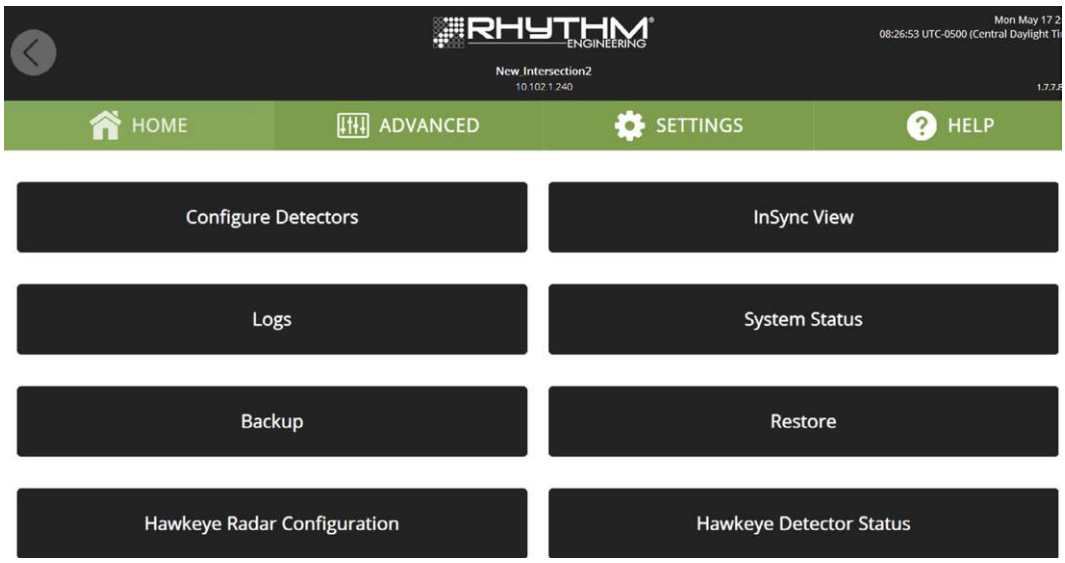


Figure 7-43. In|Sync Kiosk home screen

After all phases and external detectors are created, configure the I/O assignment.

7.11.2. Assigning inputs and outputs

After confirming that camera views are being read correctly by In|Sync, you must then select the IO board being used to connect to the inputs and outputs and then map pin inputs and signal outputs within In|Sync. This allows In|Sync to know what signal is being received (inputs) and how to place calls (outputs) correctly. **You must place the controller into Recall during this time.** Click inside the appropriate functionality field to assign a pin to that functionality.

> ***Note:*** *Mapping inputs and outputs is a functionality that is performed only through the In|Sync Kiosk*

1. Open the Advanced tab in the In|Sync Kiosk.
2. Select In|Sync.

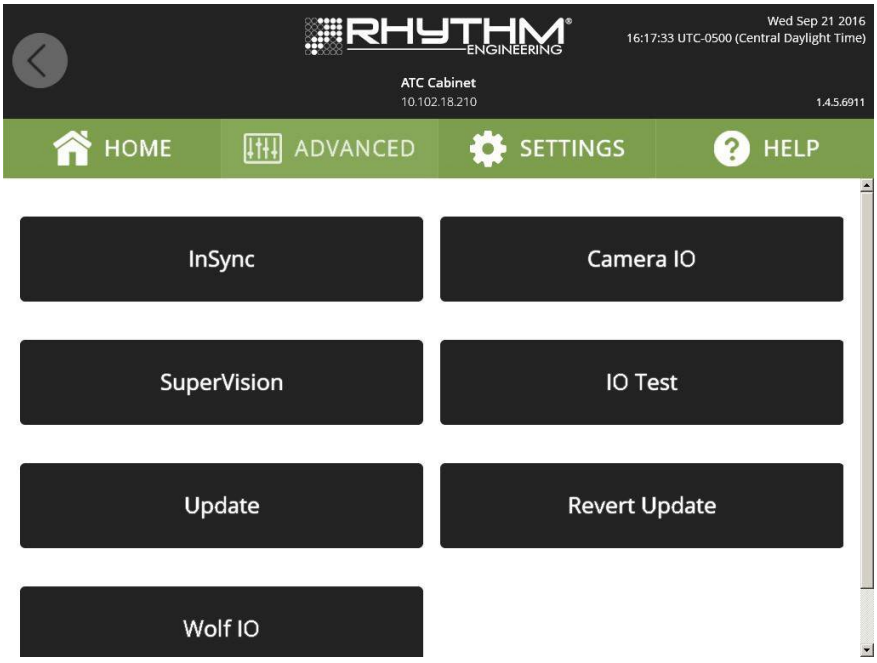


Figure 7-44. In|Sync Kiosk's Advanced screen

3. Select Edit IO Mappings.

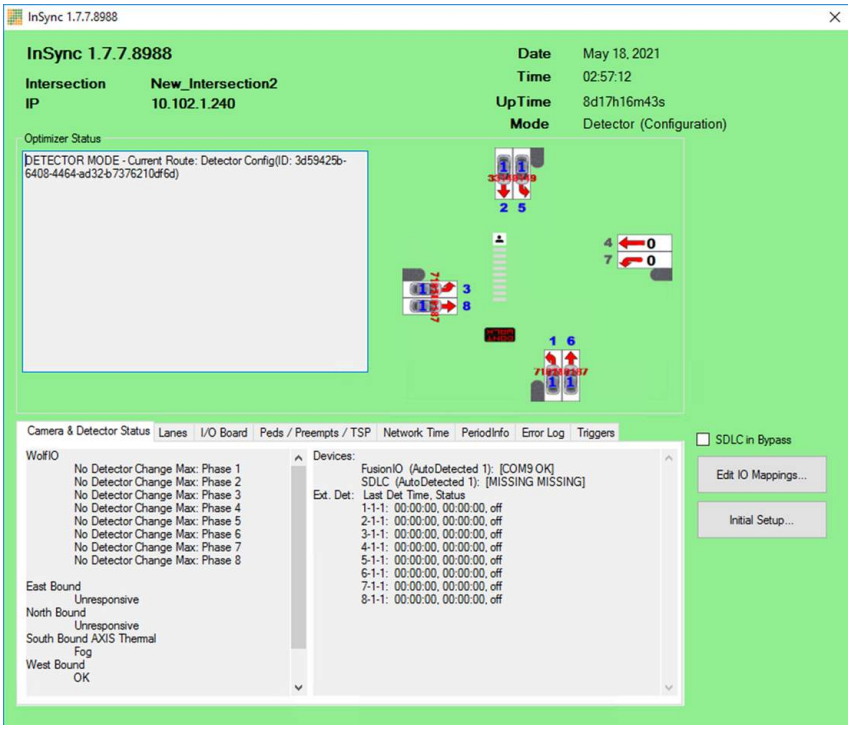


Figure 7-45. New intersection IO mappings

4. The Select Device dialog box displays. Select the I/O connection device e.g. FusionIO, SDLC Module, SDLC Intercept ITS Module or any other, so that the check box is enabled.

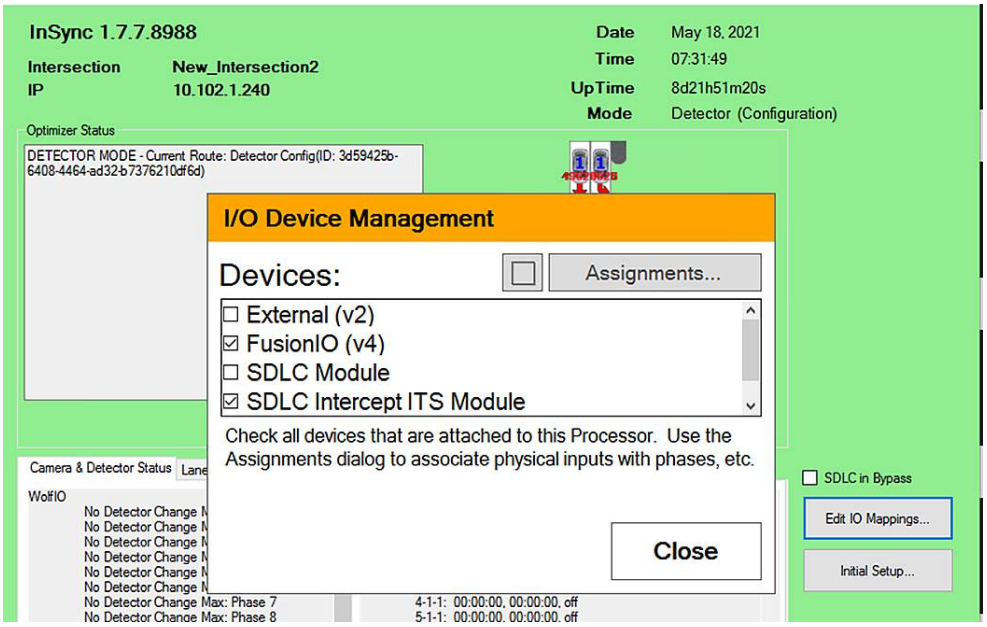


Figure 7-46. List of devices

5. With the selection made, click the Assignments... button.

> ***Note:*** *If a configuration has never been created, it's a good idea to click the Load Defaults button. This initializes all fields to appropriate values.*

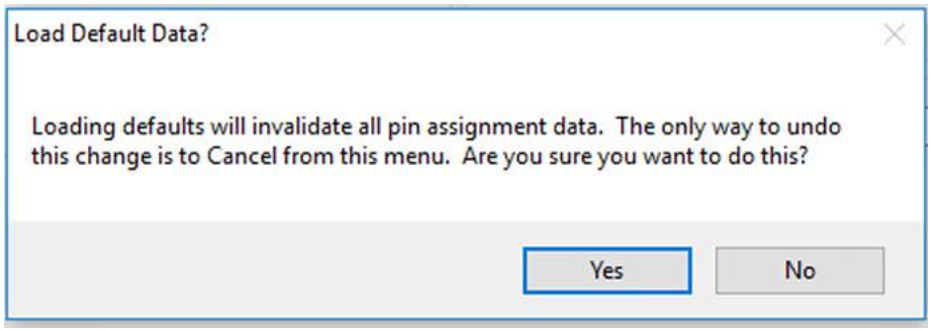


Figure 7-47. Confirmation Dialog

7.11.3. Default Inputs and Outputs

Those will be pre-defined during system configuration, based on input from the client agency, for matching the cabinet and controller IOs.

1. Select the Cabinet Interface – if you have selected the FUSION Module in the previous steps, then the drop-down list will display interfaces supporting the FUSION Module connection to the cabinet.
    - Select C1 - Mode 0 for the C1 Y-cable, or ABC - Mode 0, 7 for the ABC Y-cable.
    - Select Spade Cable when FUSION connects with a Ped Intercept Module
    - Select any other of the available options for 330 Style or NEMA cabinet connections
2. Each phase is represented by a tab on the dialog box. Select the phase you want to configure by clicking the associated tab.
3. Click inside the appropriate functionality field under Detector Inputs to assign a pin to that functionality. The Select Pins dialog box displays. Edit the defaults by picking the pins that you want mapped.

> ***Note:*** *Holding the* ***CTRL*** *key down while clicking on the pins allows you to assign multiple pins to an input/output.*

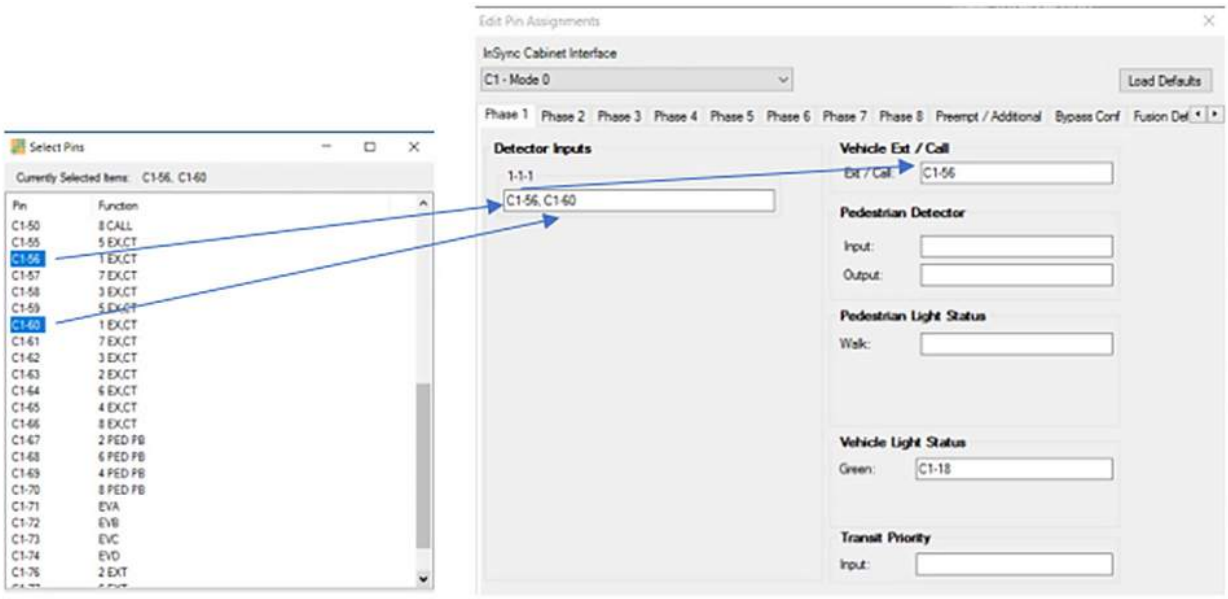


Figure 7-48. Default Assignments per Phase with C1 Y-cable

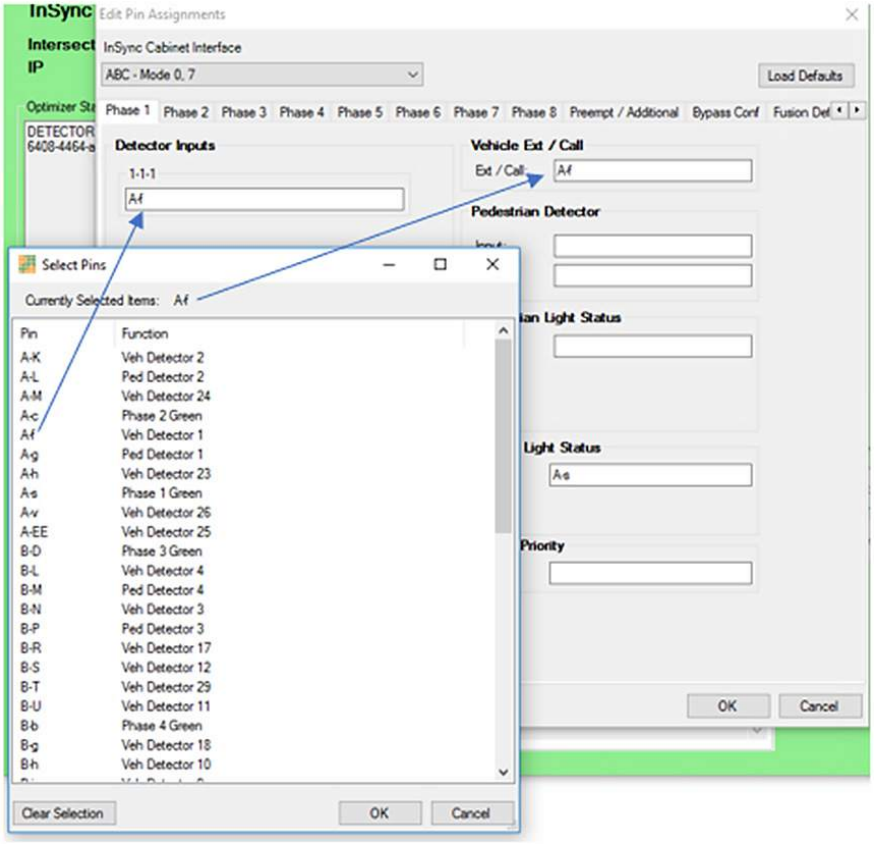


Figure 7-49. Default Assignments per Phase with ABC Y-cable

4. The pre-set values for each phase will be highlighted and you can click Clear Selection to get the list cleaned for setting new values.

5. Click OK to close the Select Pins dialog box.

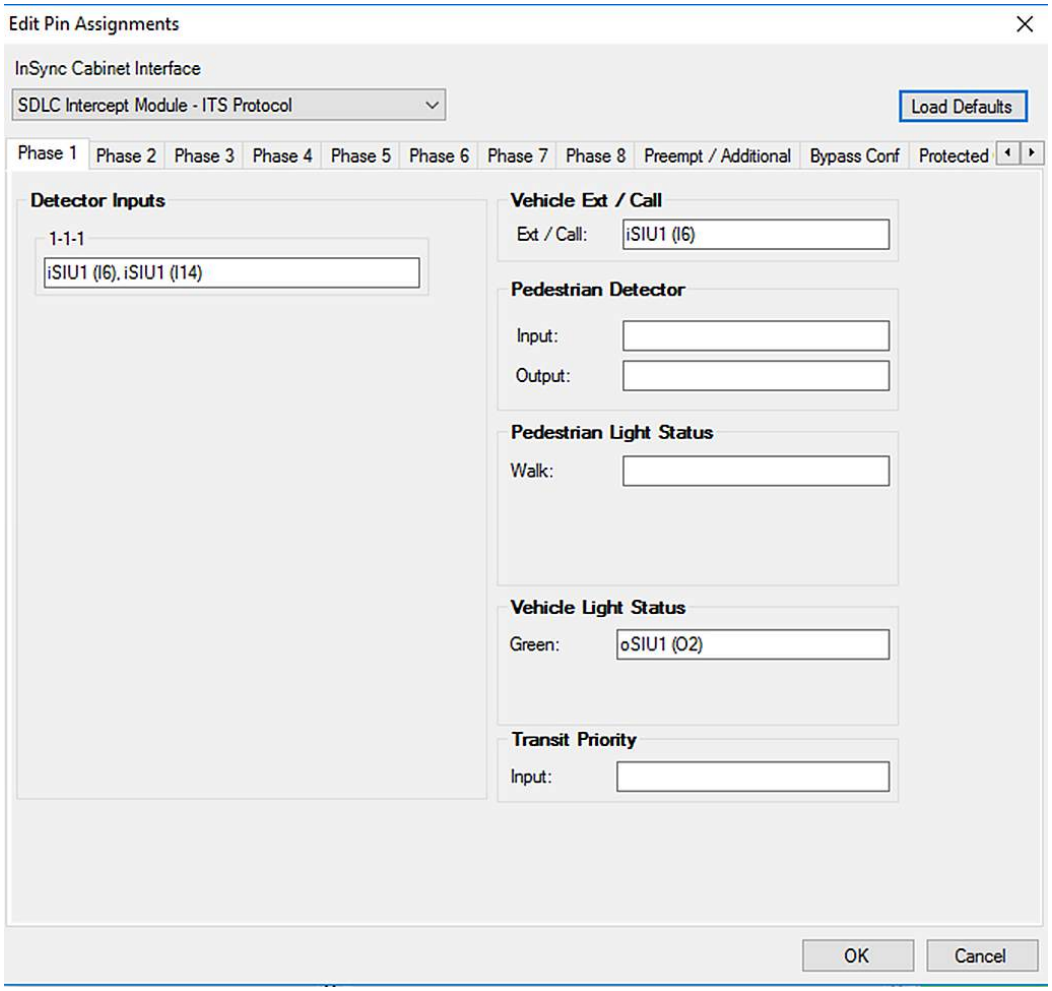


Figure 7-50. Populating New PINs

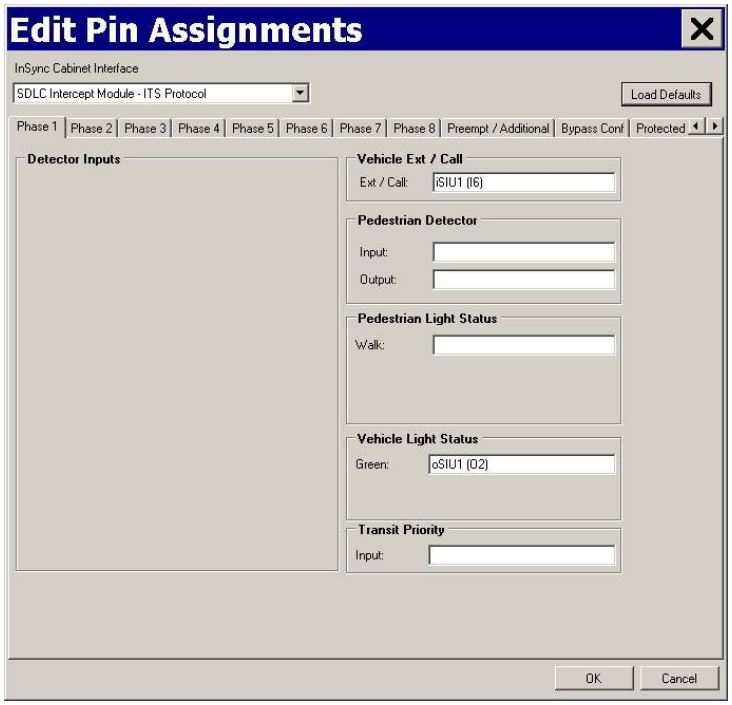


Figure 7-51. Edit Pin Assignments for SDLC-ITS

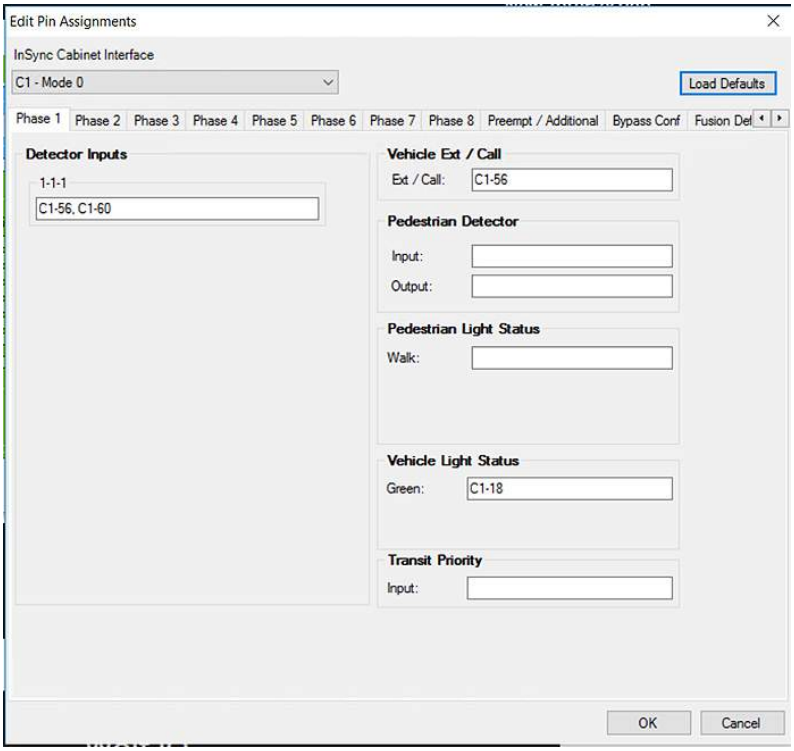


Figure 7-52. Edit Pin Assignments for C1 Y-Cable

6. Notice the detector unit number under Detector Inputs will change as you click through the Phase buttons.

    » With a FUSION module selected, the Assignments may include external detectors. Their device number will consist of three digits e.g., 1-1-1, 2-1-1, 3-1-1 etc., where the first digit typically matches the Phase, the second digit is the lane number from curb outward, and the third digit is the detector index within the lane (1 is closest to stop bar).

    » For ABC Y cable, the detector inputs will follow a naming convention that uses only letters, no digits, in the format: A – x, B – x, C – x for nominating both vehicle and ped phases.

7. Set the following parameters for each phase for Vehicle Detection:

    » External Vehicle Detectors and Phase Assignment For each Phase tab, assign the input pins (from C1-01 to C1-79), in the 'Detector Inputs'. This should match the controller's I/O assignment. Click into the text field for the listed detector and select the pin assignment for that detector input to In|Sync.

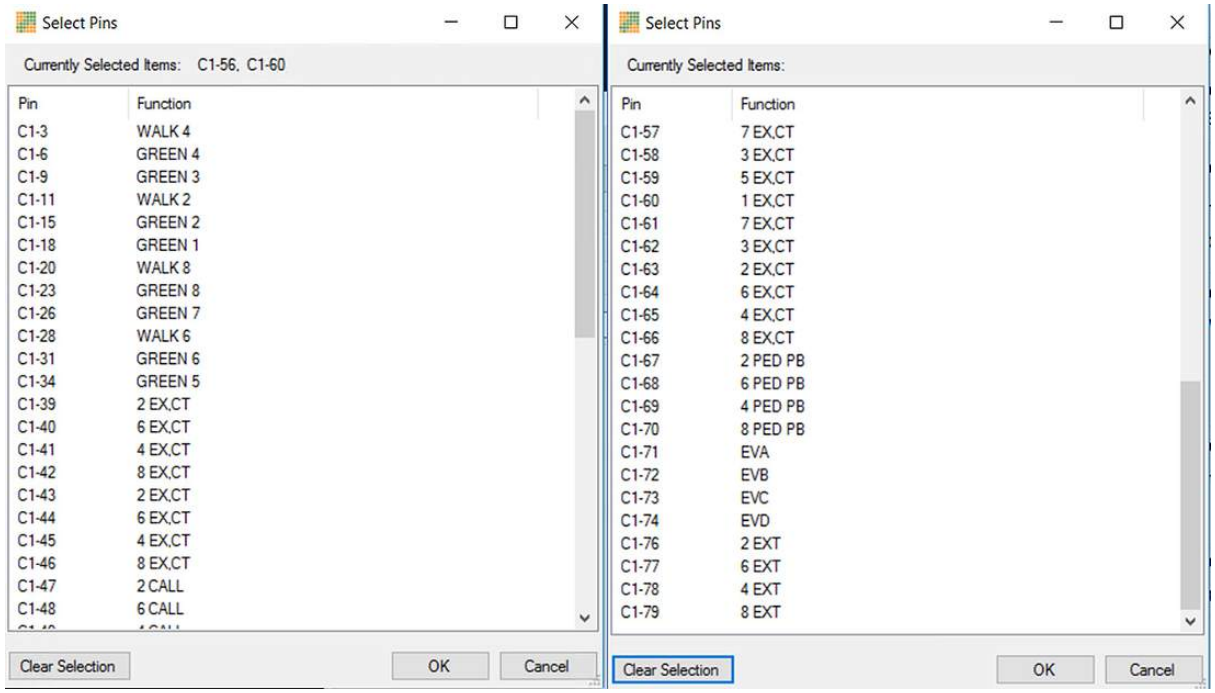


Figure 7-53. Complete Phase PIN and Function List

» For the 'Vehicle Ext / Call', typically it will suffice to select only one detector I/O in Detector Inputs, but you may choose all if necessary. In|Sync only needs one of the controller's detector inputs, in order to call a phase in the controller.

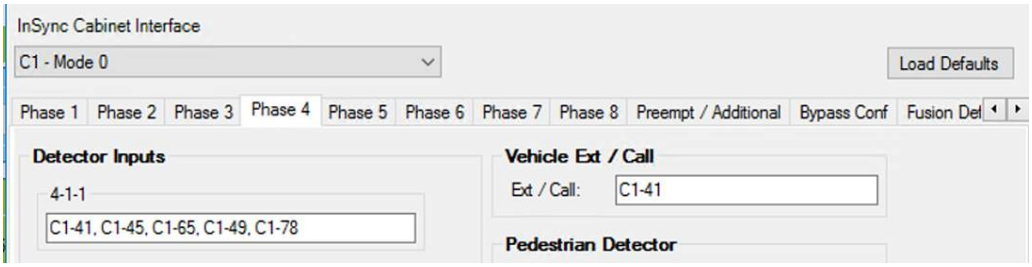


Figure 7-54. Vehicle Phase Input and Output PINs Matching

8. Set the following for each Phase for Ped Detection

» External Ped Detectors and Phase Assignment For each Phase tab, assign the input pins (from C1-01 to C1-79) to the ped detector input and output. These should be the same and match the controller's I/O assignment.

9. Set the Green and Walk Inputs for each phase.

C1 Y-Cable Pin Assignments

Pin	Function	Phase	IO Assignment
C1-3	WALK 4	Phase 4	Ped Light Status
C1-6	GREEN 4	Phase 4	Veh Light Status
C1-9	GREEN 3	Phase 3	Veh Light Status
C1-11	WALK 2	Phase 2	Ped Light Status
C1-15	GREEN 2	Phase 2	Veh Light Status
C1-18	GREEN 1	Phase 1	Ped Light Status
C1-20	WALK 8	Phase 8	Ped Light Status
C1-23	GREEN 8	Phase 8	Veh Light Status
C1-26	GREEN 7	Phase 7	Veh Light Status
C1-28	WALK 6	Phase 6	Ped Light Status
C1-31	GREEN 6	Phase 6	Veh Light Status
C1-34	GREEN 5	Phase 5	Veh Light Status
C1-39	2 EX,CT	Phase 2	Det Input/Veh Output
C1-40	6 EX,CT	Phase 6	Det Inputs/Veh Outputs
C1-41	4 EX,CT	Phase 4	Det Inputs/Veh Outputs
C1-42	8 EX,CT	Phase 8	Det Inputs/Veh Outputs
C1-43	2 EX,CT	Phase 2	
C1-44	6 EX,CT	Phase 6	Det Inputs
C1-45	4 EX,CT	Phase 4	
C1-46	8 EX,CT	Phase 8	
C1-47	2 EX,CT	Phase 2	
C1-48	6 EX,CT	Phase 6	Det Inputs
C1-49	4 EX,CT	Phase 4	Det Inputs
C1-50	8 EX,CT	Phase 8	Det Inputs
C1-55	5 EX,CT	Phase 5	Det Input/Veh Output
C1-56	1 EX,CT	Phase 1	Det Input/Veh Output
C1-57	7 EX,CT	Phase 7	Det Input/Veh Output
C1-58	3 EX,CT	Phase 3	Det Input/Veh Output
C1-59	5 EX,CT	Phase 5	Det Input
C1-60	1 EX,CT	Phase 1	Det Input
C1-61	7 EX,CT	Phase 7	Det Input
C1-62	3 EX,CT	Phase 3	Det Input
C1-63	2 EX,CT	Phase 2	Det Input
C1-64	6 EX,CT	Phase 6	Det Inputs
C1-65	4 EX,CT	Phase 4	
C1-66	8 EX,CT	Phase 8	Det Inputs
C1-67	2 PED PB	Phase 2	Ped Detector
C1-68	6 PED PB	Phase 6	Ped Detector
C1-69	4 PED PB	Phase 4	Ped Detector
C1-70	8 PED PB	Phase 8	Ped Detector
C1-71	EVA		
C1-72	EVB		
C1-73	EVC		
C1-74	EVD		
C1-76	2 EXT	Phase 2	Det Inputs
C1-77	6 EXT	Phase 6	Det Inputs
C1-78	4 EXT	Phase 4	Det Inputs
C1-79	8 EXT	Phase 8	Det Inputs

Figure 7-55. Default PIN List for C1 Y-Cable

ABC Y-Cable Pin Assignments

Pin	Function	Phase	IO Assignment
A-K	Veh Detector 2	Phase 2	Det Input/Veh Output
A-L	Ped Detector 2	Phase 2	Ped Detector
A-M	Veh Detector 24		
A-c	Phase 2 Green	Phase 2	Vehicle Light Status
A-f	Veh Detector 1	Phase 1	Det Input/Veh Output
A-g	Ped Detector 1		
A-h	Veh Detector 23		
A-s	Phase 1 Green	Phase 1	Vehicle Light Status
A-v	Veh Detector 26		
A-EE	Veh Detector 25		
B-D	Phase 3 Green	Phase 3	Vehicle Light Status
B-L	Veh Detector 4	Phase 4	Det Input/Veh Output
B-M	Ped Detector 4	Phase 4	Ped Detector
B-N	Veh Detector 3	Phase 3	Det Input/Veh Output
B-P	Ped Detector 3		
B-R	Veh Detector 17		
B-S	Veh Detector 12		
B-T	Veh Detector 29		
B-U	Veh Detector 11		
B-b	Phase 4 Green	Phase 4	Vehicle Light Status
8-g	Veh Detector 18		
8-h	Veh Detector 10		
Bi	Veh Detector 9		
B-j	Veh Detector 27		
B-k	Veh Detector 30		
8-m	Veh Detector 31		
8-n	Veh Detector 32		
8-x	Veh Detector 28		
C-P	Veh Detector 5	Phase 5	Det Inputs/Veh Outputs
C-R	Ped Detector 5		
C-S	Veh Detector 6	Phase 6	Det Inputs/Veh Outputs
C-T	Ped Detector 6	Phase 6	Ped Detector
C-U	Ped Detector 7		
C-V	Veh Detector 7	Phase 7	Det Inputs/Veh Outputs
C-W	Ped Detector 8	Phase 8	Ped Detector
C-X	Veh Detector 16		
C-f	Phase 7 Green	Phase 7	Vehicle Light Status
C-g	Phase 6 Green	Phase 6	Vehicle Light Status
C-i	Phase 5 Green	Phase 5	Vehicle Light Status
C-m	Veh Detector 13		
C-n	Veh Detector 19		
C-p	Veh Detector 14		
C-q	Veh Detector 20		
C-r	Veh Detector 21		
C-s	Veh Detector 22		
C-t	Veh Detector 8	Phase 8	Det Inputs/Veh Outputs
C-x	Phase 8 Green	Phase 8	Vehicle Light Status
C-EE	Veh Detector 15		
HV_IN-0	GI		
HV_IN-0	G2		
HV_IN-0	G3		
HV_IN-0	G4		
HV_IN-0	G5		
HV_IN-0	G6		
HV_IN-0	G7		
HV_IN-0	G8		
HV_IN-0	G9		
HV_IN-1	GIO		
HV_IN-11	GII		
HV_IN-1	G12		
HV_IN-1	WALK2		
HV_IN-1	WALK4		

Default PIN List for ABC Y-Cable

SDLC Intercept Module Pin Assignments

Pin	Function	Phase	IO Assignment
IR	TF.BIUl.Output 1	Preempt/Additional	Input
IY	TF.BIUl.Output 2		
1G	TF.BIUl.Output 3	Phase 1	Veh Light Status
2R	TF.BIUl.Output 4		
2Y	TF.BIUl.Output 5		
2G	TF.BIUl.Output 6	Phase 2	Veh Light Status
3R	TF.BIUl.Output 7		
3Y	TF.BIUl.Output S		
3G	TF.BIUl.Output 9	Phase 3	Veh Light Status
4R	TF.BIUl.Output 10		
4Y	TF.BIUl .Output 11		
4G	TF.BIUl.Output 12	Phase 4	Veh Light Status
5R	TF.BIUl.Output 13		
SY	TF.BIUl.Output 14		
5G	TF.BIUl.Output 15	Phase 5	Veh Light Status
6R	TF.BIUl.Input/Output 1		
6Y	TF.BIUl.Input/Output 2		
6G	TF.BIUl.Input/Output 3	Phase 6	Veh Light Status
7R	TF.BIUl.Input/Output 4		
7Y	TF.BIUl.Input/Output 5		
7G	TF.BIUl.Input/Output 6	Phase 7	Veh Light Status
8R	TF.BIUl.Input/Output 7		
8Y	TF.BIU1 .Inp,,t/Output 8		
8G	TF .BIU1 .Inp<.t/Output 9	Phase 8	Veh Light Status
Preempt 1 Status	TF. BIU1. Input/Output 12		
13G	TF.BIU2.0utput 15	Phase 2	Ped Light Status
14R	TF.BIU2.Input/Output 1		
14Y	TF.BIU2.Input/Output 2		
14G	TF.BIU2.Input/Output 3	Phase 4	Ped Light Status
15R	TF.BIU2.Input/Output 4		
15Y	TF.BIU2.Input/Output 5		
15G	TF.BIU2.Input/Output 6	Phase 6	Ped Light Status
16R	TF.BIU2.Input/Output 7		
16Y	TF.BIU2.Input/Output 8		
16G	TF.BIU2.Input/Output 9	Phase 8	Ped Light Status
Preempt 3 Status	TF.BIU2.Input/Output 12		
Det01	DR.BIU 1.Input/Output 1	Phase 1 + Peempt/Add	Det Input/Veh Output
Det02	DR.BIU 1.Input/Output 2	Phase 2	Det Input/Veh Output
Det03	DR.BIU 1.Input/Output 3	Phase 3	Det Input/Veh Output
Det04	DR.BIU 1.Input/Output 4	Phase 4	Det Input/Veh Output
Det05	DR.BIU 1.Input/Output 5	Phase 5	Det Input/Veh Output
Det06	DR.BIU 1.Input/Output 6	Phase 6	Det Input/Veh Output
Det07	DR.BIU 1.Input/Output 7	Phase 7	Det Input/Veh Output
Det08	DR.BIU 1.Input/Output 8	Phase 8	Det Input/Veh Output
BANK1_IN1	Intercept Module Bank 1 In 1	Phase 2	Ped Detector
BANK1_IN2	Intercept Module Bank 1 In 2	Phase 4	Ped Detector
BANK1_IN3	Intercept Module Bank 1 In 3	Phase 6	Ped Detector
BANK1_IN4	Intercept Module Bank 1 In 4	Phase 8	Ped Detector
BANK2_IN1	Intercept Module Bank 2 In 1		
BANK2_IN2	Intercept Module Bank 2 In 2		
BANK2_IN3	Intercept Module Bank 2 In 3		
BANK2_IN4	Intercept Module Bank 2 In 4		
PIM_OK	Intercept Module COM OK		
PIM_RESET	Intercept Module Reset since last COM		
PIM_BYPASS	Intercept Module in Bypass Mode		
CFG_ERR	Illegal BIU on intercept bus		

Figure 7-56. Default SDLC Intercept Module PIN List

7.11.4. Preempt / Additional

Preemption

Those values can be assigned here for each approach. Most controllers, connected to InSync, use the default PINs outlined below for monitoring and receiving Preemption calls:

Outputs

In this section you can define which Pin / Output to be triggered from the module when a given Function or event occurs.

Inputs

In this section you can define which Pin / Input which is received by the module will result in an internal Function to be enacted.

To add a new Input or Output, pick the Function and Pin from the drop-down menus and click the Add Output/Input button.

- Example Fusion module via C1 Y-cable: the image below shows that when In|Sync is in Adaptive Mode (Function), then it will generate a trigger Output on pin C1-39. For Inputs, the example image shows that when pin C1-3 is triggered, In|Sync will see this as Cabinet signal 1 event has occurred. Cabinet signal 1 is an event that can be tied to different configurations and is commonly used in the ICM (Integrated Corridor Management) configuration in InTraffic.

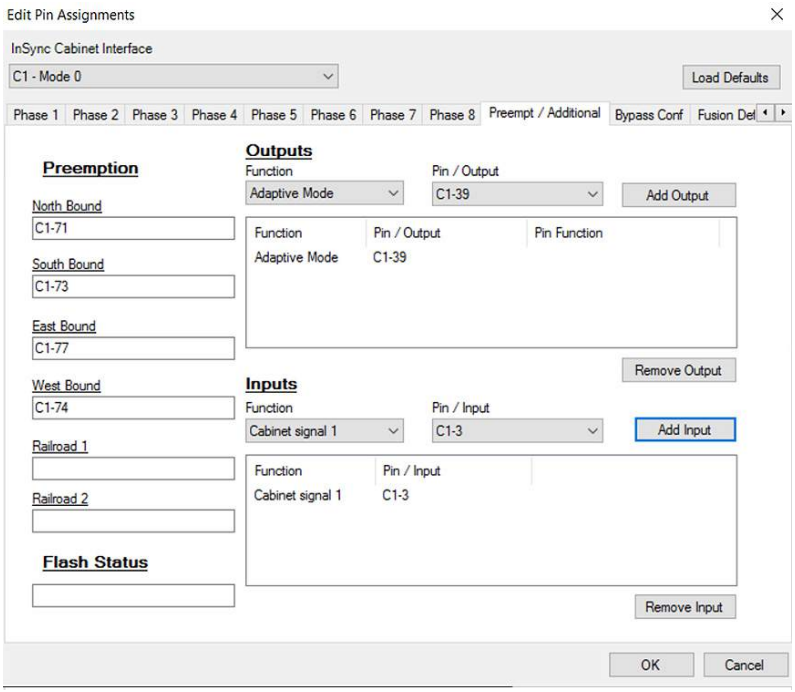


Figure 7-57. Preempt / Additional Pin Assignments for FUSION Module with C1 Y-Cable

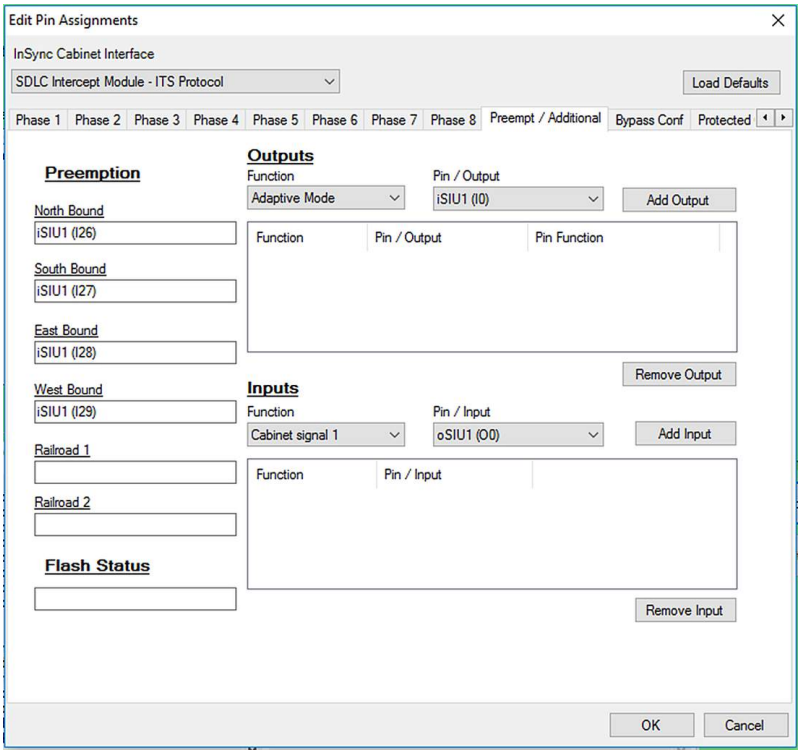


Figure 7-58. Preempt / Additional Pin Assignments for FUSION Module with ABC Y-Cable

- Example for SDLC ITS module: by default, most controllers will set I/O 26-29 as Preempt Detectors 1-4. Those can be assigned here for each approach.

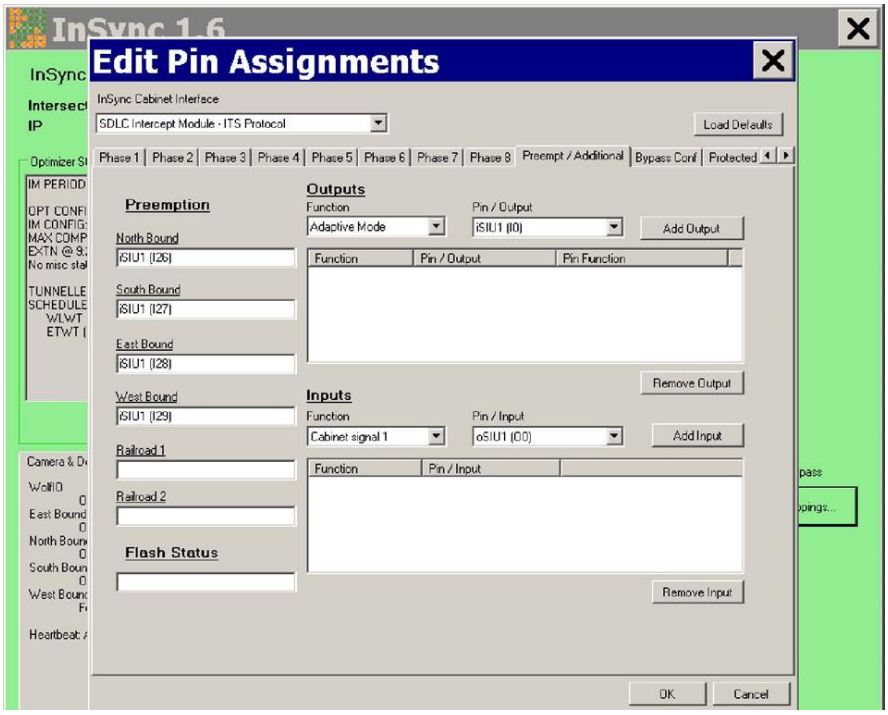


Figure 7-59. Preempt Pin Assignments with SDLC-ITS Module

INPUT SIU I/O ASSIGNMENT TO CONTROLLER

- External Vehicle Detectors and Phase Assignment For each Phase tab - assign the input bits (I0-I53, I56-I59) for each input SIU to each external vehicle detector in the 'Detector Inputs'. This should match the controller's I/O assignment.
- External Ped Detectors and Phase Assignment For each Phase tab - assign the input bits (I0-I53, I56-I59) for each input SIU to the ped detector input and output. These should be the same and match the controller's I/O assignment.

SIU 9 IO	IO Assignment	Phase		SIU 9 IO	IO Assignment	Phase
6	Vehicle Detector 1			22	Ped Detector 1	2
7	Vehicle Detector 2	2		23	Ped Detector 2	4
8	Vehicle Detector 3	3		24	Ped Detector 3	6
9	Vehicle Detector 4	4		25	Ped Detector 4	8
10	Vehicle Detector 5	5		26	Preempt Detector 1	Preempt 1
11	Vehicle Detector 6	6		27	Preempt Detector 2	Preempt 2
12	Vehicle Detector 7	7		28	Preempt Detector 3	Preempt 3
13	Vehicle Detector 8	8		29	Preempt Detector 4	Preempt 4
14	Vehicle Detector 9	1				
15	Vehicle Detector 10	2				
16	Vehicle Detector 11	3				
17	Vehicle Detector 12	4				
18	Vehicle Detector 13	5				
19	Vehicle Detector 14	6				
20	Vehicle Detector 15	7				

Figure 7-60. Example I/O Assignment for a Controller from a SDLC – ITS Module

OUTPUT SIU I/O ASSIGNMENT TO CONTROLLER

- For each Phase tab, assign the output bits e.g., O0-O53, O56-O59 for SDLC-ITS Module, on each output SIU to the 'Vehicle Light Status'. This should match the controller's I/O assignment.
- For each Phase tab, assign the output bits e.g., O0-O53, O56-O59 for SDLC-ITS Module, on each output SIU to the 'Walk Light Status'. This should match the controller's I/O assignment.

SIU 9 IO	IO Assignment	Phase		SIU 9 IO	IO Assignment	Phase
0	Channel Red 1	V1		24	Channel Red 9	OLA
1	Channel Yellow 1	V1		25	Channel Yellow 9	OLA
2	Channel Green 1	V1		26	Channel Green 9	OLA
3	Channel Red 2	V2		27	Channel Red 10	OLB
4	Channel Yellow 2	V2		28	Channel Yellow 10	OLB
5	Channel Green 2	V2		29	Channel Green 10	OLB
6	Channel Red 3	V3		30	Channel Red 11	OLC
7	Channel Yellow 3	V3		31	Channel Yellow 11	OLC
8	Channel Green 3	V3		32	Channel Green 11	OLC
9	Channel Red 4	V4		33	Channel Red 12	OLD
10	Channel Yellow 4	V4		34	Channel Yellow 12	OLD
11	Channel Green 4	V4		35	Channel Green 12	OLD
12	Channel Red 5	V5		36	Channel Red 13	P2
13	Channel Yellow 5	V5		37	Channel Yellow 13	P2
14	Channel Green 5	V5		38	Channel Green 13	P2
15	Channel Red 6	V6		39	Channel Red 14	P4
16	Channel Yellow 6	V6		40	Channel Yellow 14	P4
17	Channel Green 6	V6		41	Channel Green 14	P4
18	Channel Red 7	V7		42	Channel Red 15	P6
19	Channel Yellow 7	V7		43	Channel Yellow 15	P6
20	Channel Green 7	V7		44	Channel Green 15	P6
21	Channel Red 8	V8				
22	Channel Yellow 8	V8				
23	Channel Green 8	V8		47	Channel Red 16	P8

Figure 7-61. Example I/O Assignment for a Controller from a SDLC – ITS Module

7.11.5. Bypass Configuration Assignments

If you want In|Sync to simply pass inputs through to the controller, you can define this behavior on the Bypass Conf tab. This can be done in instances where you did not purchase the Intercept Module to integrate pedestrian signals into In|Sync or for detectors that simply count volume at an intersection. In|Sync uses these settings to send signals received on the inputs of the module to the configured output of the module.

FUSION Module - for instance, the Phase 2 detector on pin C1-39, which is intercepted by the In|Sync module, can be bypassed to the controller by defining C1-39 as the Input Pin / Signal and Output Pin / Signal. Then, anytime In|Sync receives an input on pin C1-39 through this module, it will output a signal on C1-39.

The Output Pin / Signal does not have to match the Input Pin / Signal.

To assign pins to bypass In|Sync and go straight to the controller:

1. Click the **Bypass Conf** tab.
2. Select the input pin that you want In|Sync to bypass from the **Input Pin/Signal** drop-down box. Then, select the output pin that you want In|Sync to bypass from the **Output Pin/ Signal** drop-down box.
3. Click on Add to move them to the active settings list.

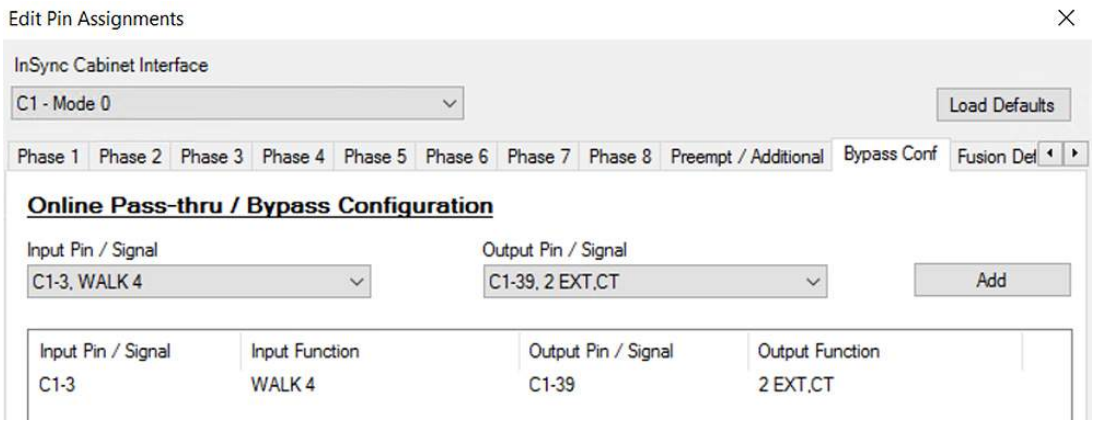


Figure 7-62. Default FUSION Output PINs with C1 Y-Cable

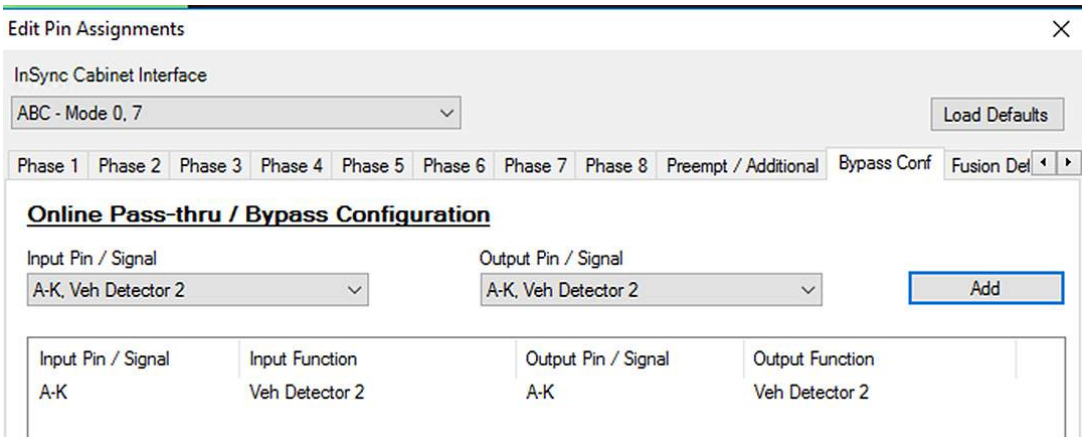


Figure 7-63. Default FUSION Output PINs with ABC Y-Cable

4. The values can also be cleared for editing, by clicking on the Remove button.

5. Once you have finished with assignments, click OK.

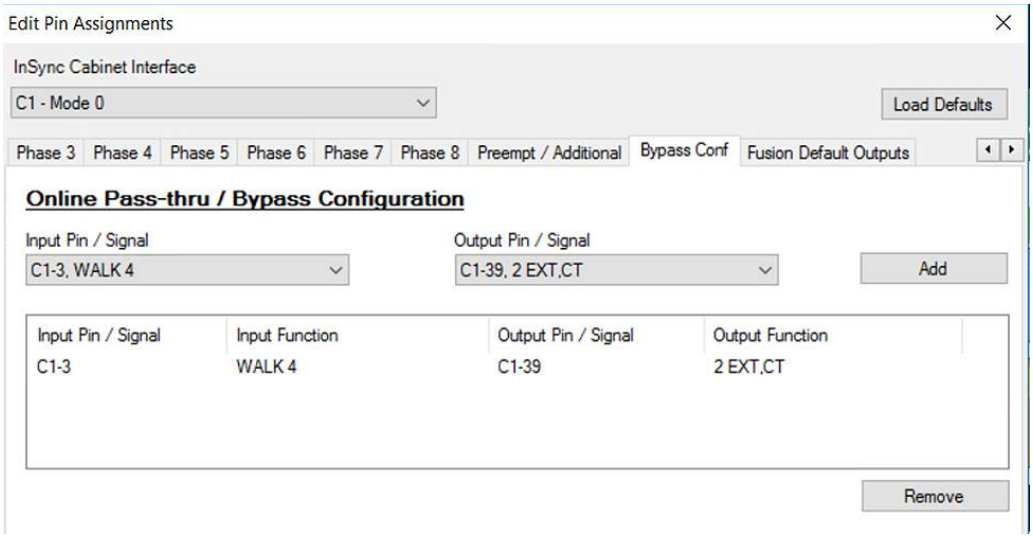


Figure 7-64. Active Bypass PIN List for C1 Y-Cable

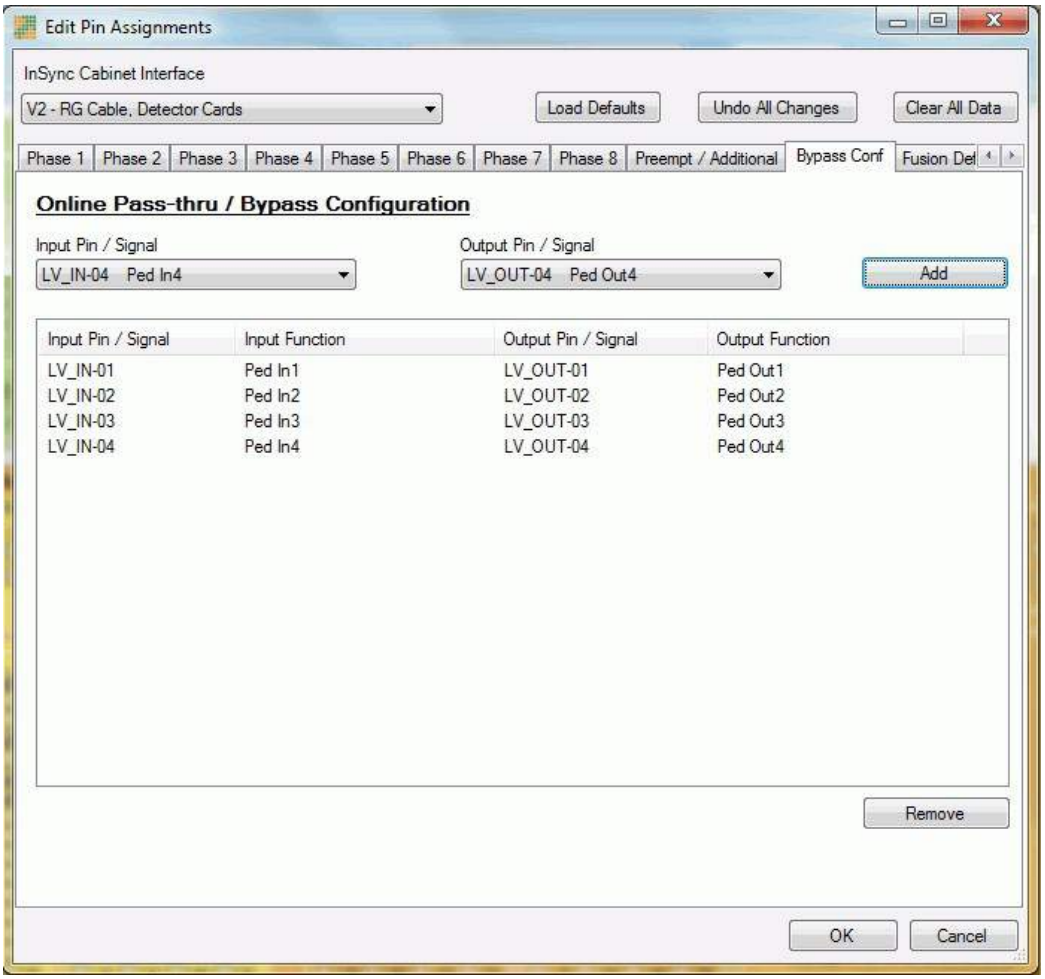


Figure 7-65. Bypass PINS for detector cards with RG cable

7.11.6. Fusion Default Outputs

One of the hardware components of the most recent style of In|Sync Processors include an IO board that can store failure configuration behavior for an intersection on its internal flash memory. This "Fusion-style" processor can then use this failure configuration to send outputs appropriately in the event of communications failure between In|Sync and the IO board.

Fusion Default Outputs tab defines failure behavior for each of the outputs (24 total) on the Fusion Module. The outputs of the Fusion Module are used to send Vehicle and Ped Detector calls to the traffic signal controller so those phases get service. Each output can be individually configured for how it will behave, by default, when there is a failure of the Fusion Module to communicate with the software service (In|Sync for instance).

1. Click on the respective tab to open the table of defaults. This view is not editable.

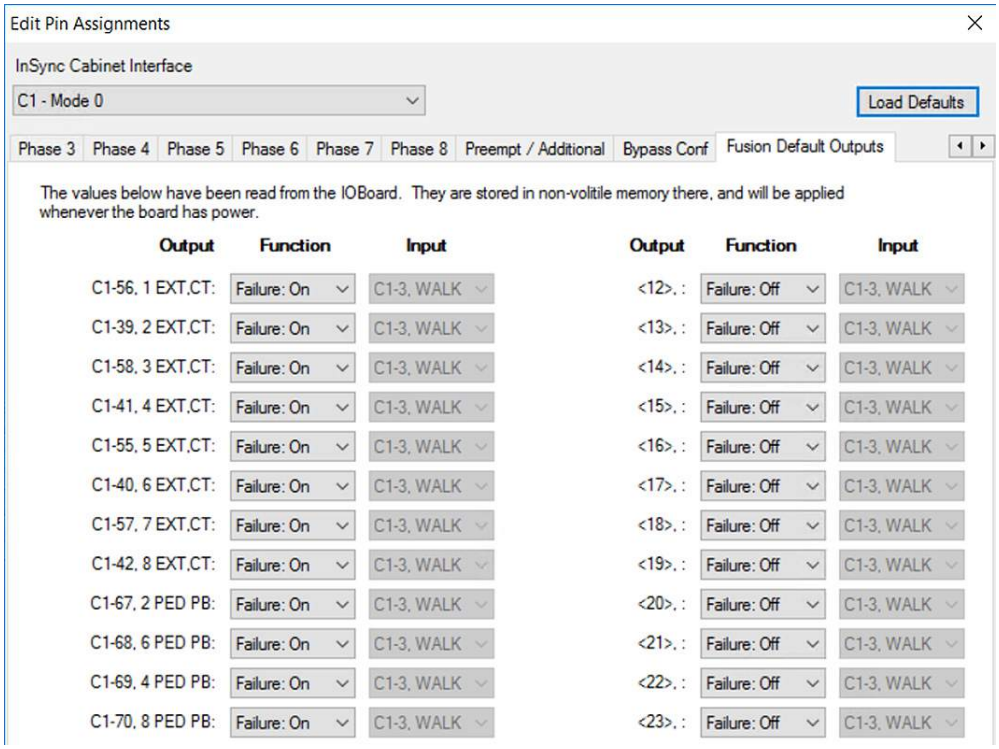


Figure 7-66. Default Fusion Output Settings for C1 Y-Cable

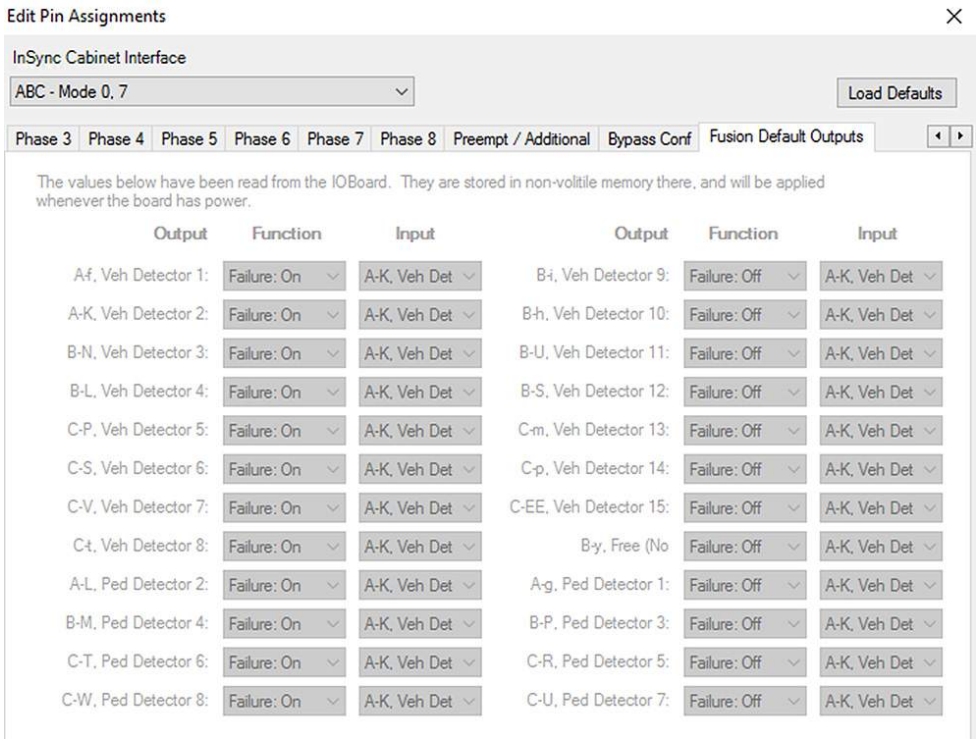


Figure 7-67. Default Fusion Output Settings for ABC Y-Cable

2. To edit the Fusion default outputs, go back to the Advanced tab in the Kiosk and select the IO Test menu option.

> ***Note:*** *While using the IO Board Tester, you are in complete control of all outputs from the module. This means that the traffic signal controller will not receive any vehicle or ped detection unless you explicitly provide it. Please make sure you completely understand what this means before you start the IO Test. Typically, the best use of the IO Test is to manually place detection calls for all Vehicle and Ped Phases while you are working with it. This ensures that all movements will be served, no one will be skipped, and no one will run the red light.*

3. Following the same steps through the IO Board > InSync Mappings will lead you to the editable screen of the FUSION defaults.

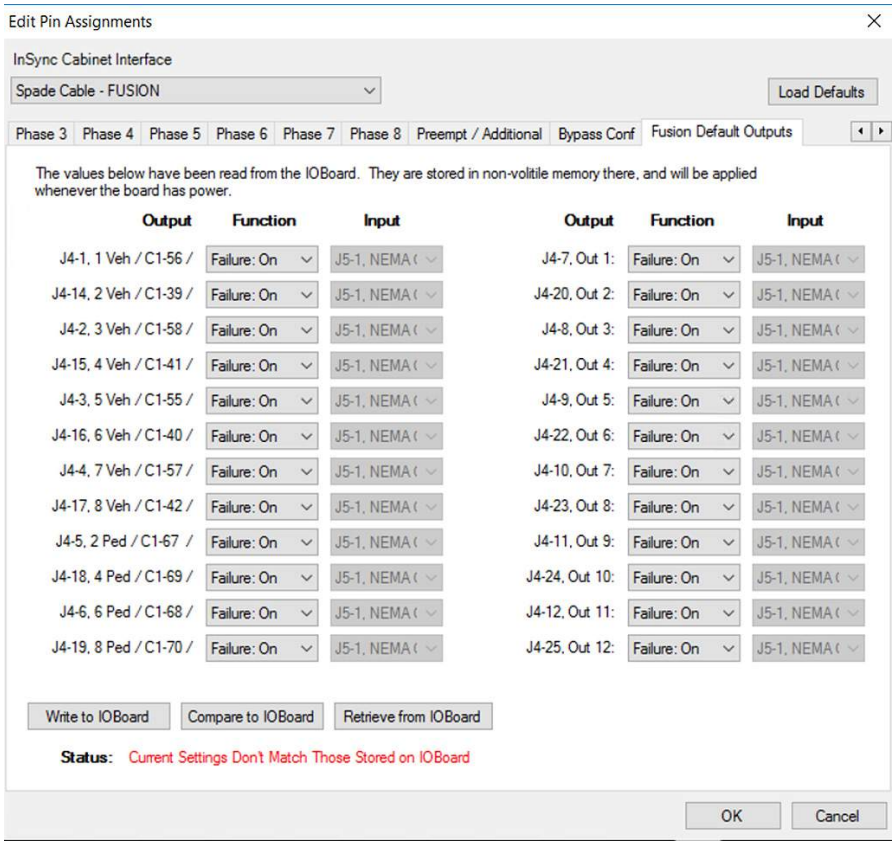


Figure 7-68. Editable List of Fusion Assignments for C1 Y-Cable

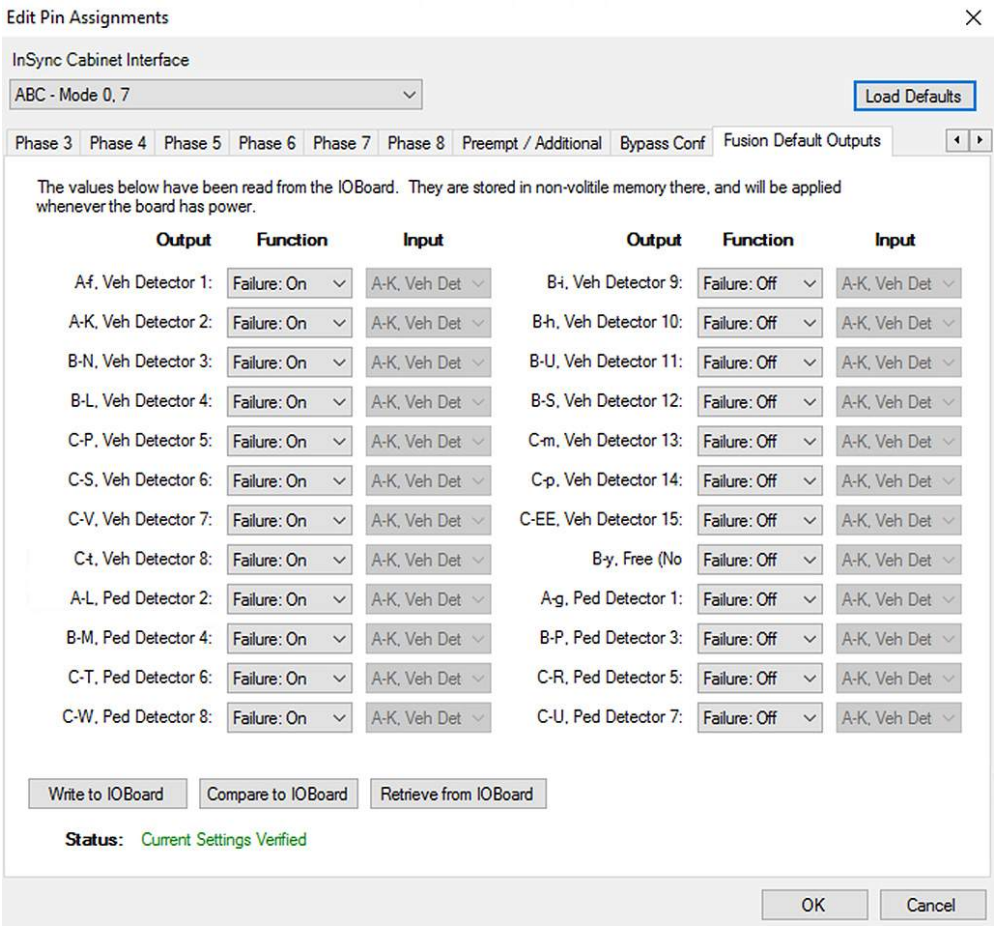


Figure 7-69. Editable List of Fusion Assignments for ABC Y-Cable.

4. In the Function drop-down, select the options that you need. The options indicate that when a communication failure occurs, how the outputs will behave.

   - Failure: Off means that the output will stay off and will produce no output signal on the given pin.
   - Failure: On means that the output will turn on and will produce a constant output signal on the pin. If this pin connects to the cabinet as a vehicle call, the constant call will force the controller to time the maximum green if there are conflicting calls on other phases..
   - Failure: Input means that the output will be generated only if the corresponding Input (select from adjacent drop-down menu) is triggered.
   - Always sends an output signal when the corresponding input signal is received, regardless, even if communication has not failed.

Typically, the Vehicle Detector calls that In|Sync uses are set to Failure: On and the Ped Detector calls are set to Failure: Input, with the corresponding input selected. All other Outputs are set to Failure: Off.

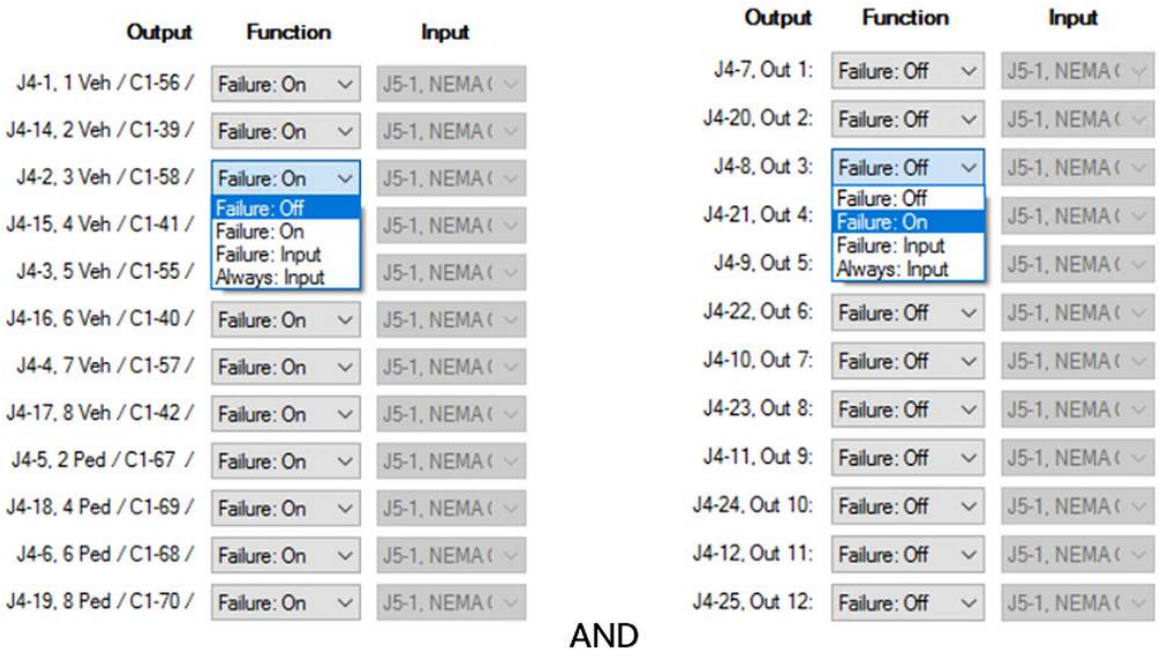


Figure 7-70. Function List in Edit Mode

- To compare the In|Sync configuration with what is stored on the Fusion Module, click the Compare to IOBoard button. This updates the 'Status' with an indication of whether or not the In|Sync configuration matches the Fusion Module configuration. If they do not match, change the configuration as needed.
- Click Write to IOBoard to ensure that the Outputs configuration is written to the Fusion Module board. The 'Status' should read 'Current Settings Verified' as on the image provided earlier. If not, click Write to IOBoard until you get that message.
- To retrieve the configuration stored on the Fusion Module, click Retrieve from IO Board. This replaces the inputs set so far.
- Finally, click OK to have the In|Sync system accept all changes.

7.11.7. Protected Outputs Configuration For SDLC – ITS Module

By default, most controllers will set I/O 26-29 as Preempt Detectors 1-4. It is a good idea to set these as Protected Outputs.

1. Select any input SIU bits that you would like to have protected. Select them from the left window, click the '>' button in the middle, and they will move to the window on the right.

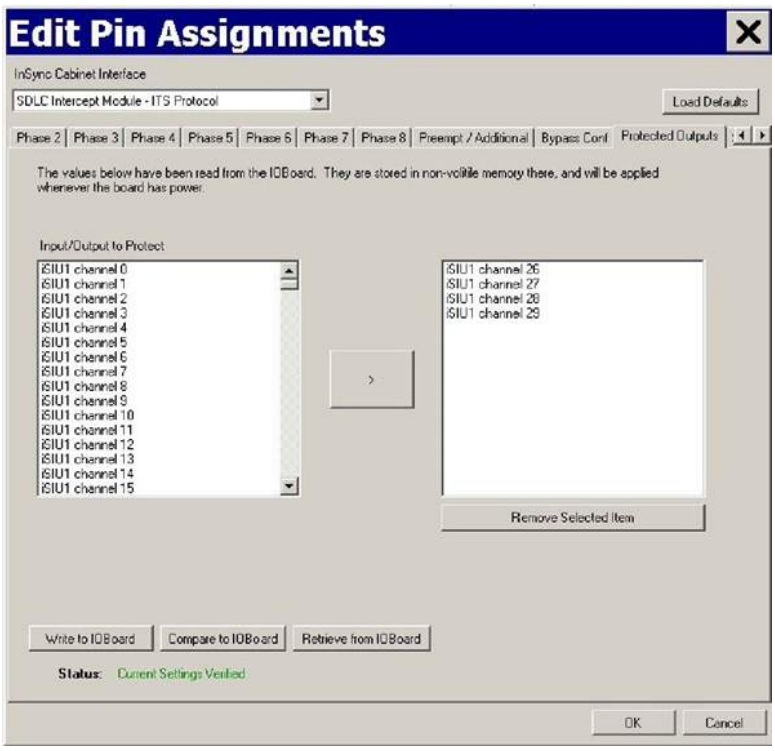


Figure 7-71. Protected Outputs Page

2. Click Write to IOBoard to ensure that the Protected Outputs configuration is written to the SDLC Intercept ITS Module. The 'Status' should read 'Current Settings Verified'. If not, click Write to IOBoard until you get that message.

3. To compare the In|Sync configuration with what is stored on the SDLC Intercept ITS Module, click the Compare to IOBoard button. This updates the 'Status' with an indication of whether or not the SIIM configuration matches the In|Sync configuration. If they do not match, set the configuration as needed, then click Write to IOBoard until you receive a 'Current Settings Verified' response.

4. To retrieve the configuration stored on the SIIM, click Retrieve from IOBoard. This replaces the listed protected inputs in the window on the right with those configured on the SIIM.

7.11.8. SIU Configuration

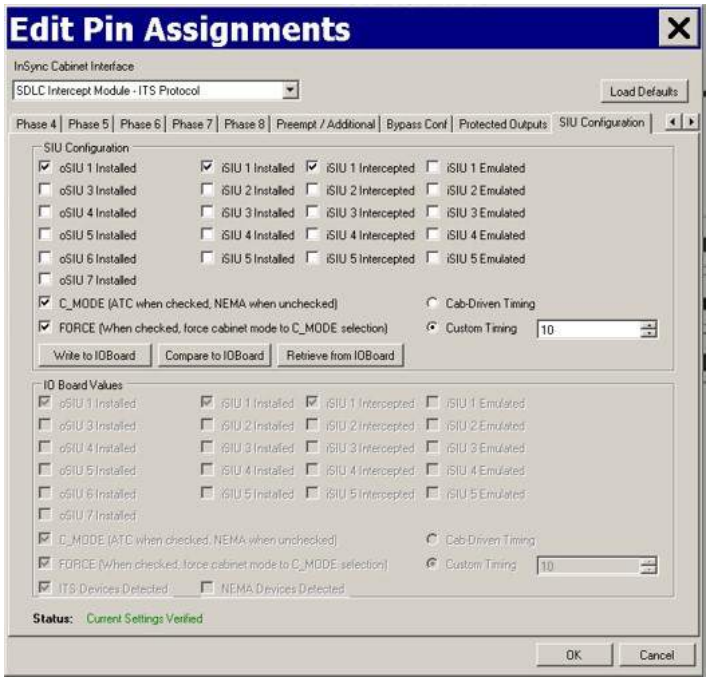


Figure 7-72. SIU Configuration Page

1. Check the boxes for C_MODE and FORCE.
2. Select the Custom Timing radio button and set the value to 10.
3. Select all boxes for any output SIUs installed (oSIU 1, 3, 4, 5, 6, 7). The ITS standard does not allow for some combinations of output SIUs to be installed, but you are not prevented from those configurations.
4. Select all boxes for the corresponding input SIU configuration. Input SIUs are numbered 1-5. They correspond to SIU addresses 9-13 or as the controller refers to them, SIU 9-13. SIUs 913 are input SIUs. Rhythm Engineering refers to them as input SIUs 1-5 or iSIU 1-5. An input SIU (iSIU) can be Installed (Not Intercepted), Installed and Intercepted, or Emulated.
5. Typically, the iSIU will be Installed and Intercepted. This means that a physical iSIU exists in the cabinet and that In|Sync is interacting with it exclusively, intercepting the communication between the iSIU and the controller. For this type of configuration, the iSIU is connected to the SIIM's ICP port.

6. Additionally, an iSIU might be Installed in the cabinet but not Intercepted by In|Sync. This means that a physical iSIU exists in the cabinet and it is connected to the cabinet SB #1 Bus Assembly directly. In|Sync is made aware that the iSIU exists, so that it can gather information from the iSIU responses to the controller.
7. Lastly, an iSIU might be Emulated by In|Sync. This means that there is no physical iSIU installed in the cabinet. Instead, the SIIM is acting exclusively as the iSIU to the controller.
8. Click Write to IOBoard to ensure that the SIU configuration is written to the SDLC Intercept ITS Module. The Status should read 'Current Settings Verified.' If not, click Write to IOBoard until you get that message.
9. To compare the In|Sync configuration with what is stored on the SDLC Intercept ITS Module, click Compare to IOBoard. This updates the 'Status' with an indication of whether or not the SIIM configuration matches the In|Sync configuration. If they do not match, set the configuration as needed, then click Write to IOBoard until you receive a 'Current Settings Verified' response.
10. To retrieve the configuration stored on the SIIM, click Retrieve from IOBoard. This lists the SIIM configuration in the 'IO Board Values' section. You can use this to compare the values.
11. Click OK on the Edit Pin Assignments dia log box. This saves the IO mappings.
12. Click Close on the I/O Device Management dialog box.

7.11.9. Detector Rack BIUs Setup

When the connection between the In|Sync processor and the traffic signal controller goes through an SDLC Intercept Module, you can define which DR BIUs exist. It is required that DR BIUs be mapped to controller detector rack ports. This allows In|Sync to scan for these connections and report when a DR BIU is missing or has failed. Input DR BIUs are sending calls to the SDLC module. Typically, Rhythm is only using DR BIU1 but if the client framework requires any other configuration, select all that apply.

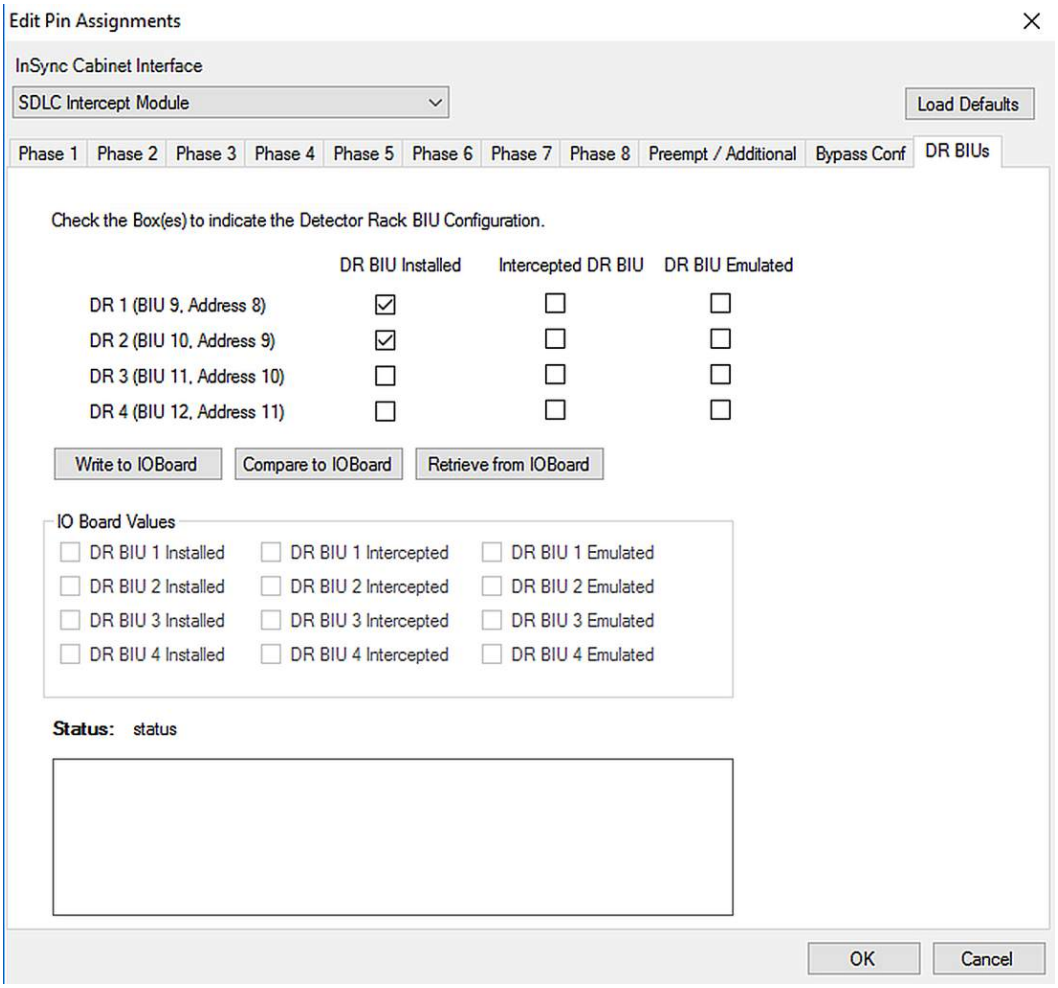


Figure 7-73. Main screen for defining DR BIUs

1. Check all boxes where corresponding input DR BIU needs to be configured.

    a. DR BIUs are numbered 1-4. They correspond to SDLC SIU addresses 8-11 or in terms of controller setup: BIU 9-12.

    b. When choosing the way to match DR BIUs to all subsequent ports, you can select from three available options:

        - Installed (No interception)
        - Installed and Intercepted (Interception device added)
        - Emulated (When no physical port exists on the controller)

2. Consider the behavior patterns to make your choice:

- DR BIU Installed + Intercepted – This is the most wide-spread scenario. This means that a physical DR BIU exists on the SDLC and that In|Sync is interacting with it exclusively, while also intercepting the communication between the DR BIU and the controller on its ICP port.
- DR BIU Installed: It might be Installed in the cabinet but not Intercepted by In|Sync. This means that a physical DR BIU exists on the SDLC board and it is connected to the cabinet ICP or CAB port directly.
- DR BIU Emulated: We would use emulations when there is not an existing detector card rack at the controller and a corresponding BIU. To establish a connection, a controller port needs to be virtually simulated.

3. When all configuration is completed, sync the configuration with the master In|Sync system. To ensure that the update is saved and matches the SDLC setup, there are three control options available:
   - Click Write to IOBoard to ensure that the SIU configuration is written to the SDLC Intercept ITS Module. The Status should read "Current Settings Verified". If not, click Write to IOBoard until you get that message.
   - To compare the In|Sync configuration with what is stored on the SDLC Intercept module board, click Compare to IOBoard. This command will return a comparison result of whether or not the SIIM configuration matches the In|Sync configuration. If they do not match, amend the configuration, and then click Write to IOBoard until you receive a confirmation.
   - To retrieve the configuration stored on the SIIM, click Retrieve from IOBoard. This lists the SIIM configuration in the 'IO Board Values' section. You can use this to modify DR BIU the values.
4. Click OK on the Edit Pin Assignments dialog box. This saves the IO mappings.
5. Click Close on the I/O Device Management dialog box.

Failure to Detect DR BIUs

If the SDLC Intercept Module cannot detect a configured DR BIUs for 30 consecutive seconds, In|Sync displays an error in its In|Sync Dashboard and then automatically re-scans for the DR BIUs.

Common causes of DR BIUs not being detected include:

- Connector coming unattached or loose on the port
- DR BIU going bad and needing replacement

In|Sync continues to re-scan for the missing DR BIU until the DR BIU comes back online (from either replacing the BIU or correcting the connectivity problem). The maximum amount of time for a corrected DR BIU to be recognized by In|Sync is 90 seconds.

7.11.10. Confirming Inputs and Outputs

After configuring the intersection, configuring detectors and mapping the detector inputs and controller outputs, you must verify that In|Sync is correctly reading the inputs and sending the correct outputs to the controller. To do so:

1. Within the In|Sync application, observe the icon view of the intersection in the top center, verifying that it reflects the correct number of lanes for each phase assigned.
2. Click the **I/O Board** tab. Verify that Communication Statuses all read **OK**.
3. Once you have confirmed that In|Sync is accurately receiving detections and sending calls, take the controller out of recall.
4. Look at the IO Board Status to verify communication is normal.

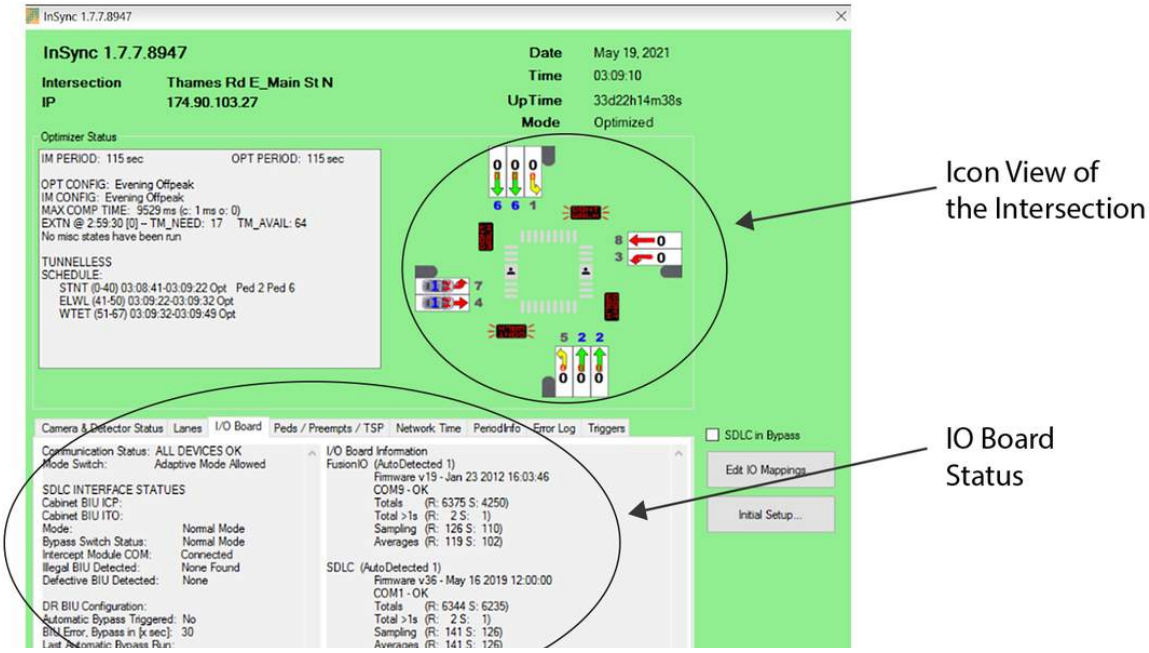


Figure 7-74. Confirming that In|Sync is working properly

Optionally, you can use the IO-Board Tester to con firm hardware connections. To do so:

1. From the In|Sync Kiosk, select **IO Test** from the Advanced screen. The IO Board Tester application opens.
2. The Intersection View represents how In|Sync perceives the intersection based on how the raw inputs/outputs are mapped to/from the IO board. To ensure that the intersection view is accurate, double-check the mapping configuration.

If all detectors, phases and lanes have already been defined, you can use the In|Sync Mapping button to test the hardware. Otherwise, use the Tester Mapping button to load the default mapping. Changes made within the Tester Mapping are not saved.

3. Verify that there are green returns for each phase in the Inputs section.
4. Selecting one of the phases in the **Outputs** section should place a call to that phase. For detector cards, the LED on the detector card will immediately light up and you will see a call placed for that phase on the signal controller. Test all phases systematically to ensure that communications between the In|Sync Processor and the controller are configured correctly.

   TIP: You can view which pins are associated with an output call by hovering your mouse over the output. The pin assignment displays in the tool tips.

> ***Note:*** *If you did not set up the detections within the Configure Detectors utility, you can still test whether In|Sync is receiving inputs from the intersection by clicking the Tester Mapping button. These inputs reflect a default configuration for the cabinet interface.*

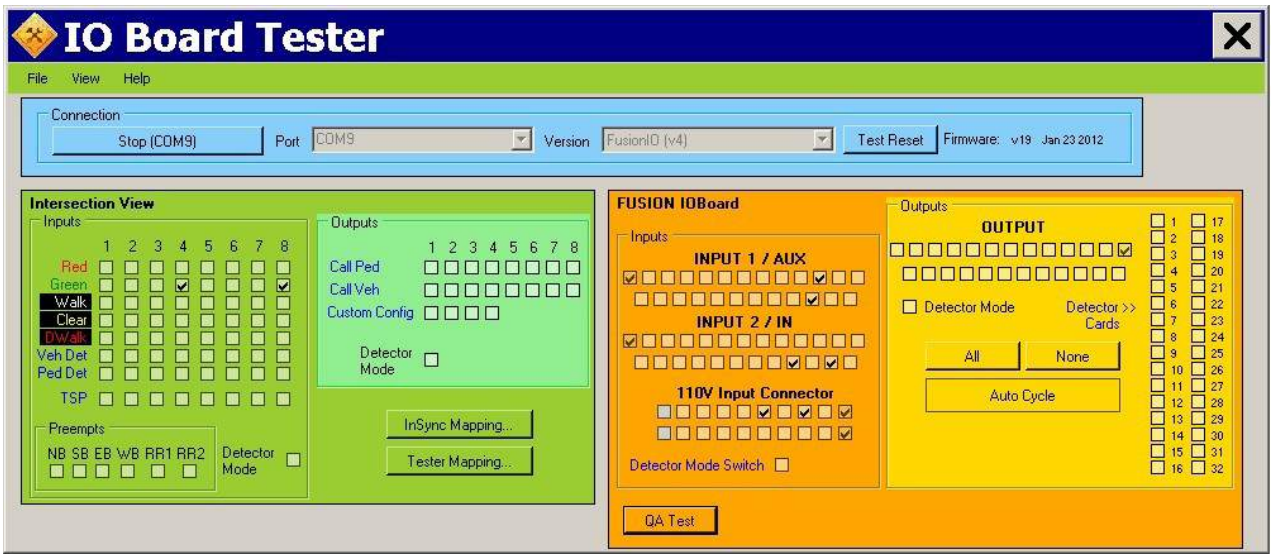


Figure 7-75. The IO Board Tester program

5. Click the **X** icon (top right corner) when finished to exit and restart In|Sync.
6. Once you have confirmed that In|Sync is accurately receiving detections and sending calls, take the controller out of recall.

7.11.11. Run in Non-Bypass Mode

After configuration is complete, move the BYPASS switch to the non-BYBASS side. After about 10 sec., the BYPASS LED goes off.

From this point forward, In|Sync uses the SIIM to read information from the SB #1 bus from output SIUs, read information from the input SIUs and respond to the controller for input SIU detector information. For detailed instructions on configuring Inputs and Outputs settings, refer to Chapter 8, section 8.6. I/O Assignment Configuration.

7.11.12. Fusion Processor Power Off Outputs Configuration

The Fusion Module processor has a Power Off Outputs (POO) configuration that has 24 DIP switches. Each DIP switch corresponds to one of the 24 outputs of the Fusion I/O Board.



Figure 7-76. FUSION Module Power POO Switches

The DIP switches can be configured in an ON or OFF position. Up/right/toward the numbers is ON. Down/left/away from the numbers is OFF.

- The Power Off Outputs configuration is only used when the Fusion I/O Board is powered off. Otherwise, if the Fusion I/O Board is powered on, then the outputs are driven by the software.
  - » When the Fusion I/O Board is powered off and the DIP switch is in the ON position, the corresponding output will be ON (logic low).
  - » If the DIP switch is in the OFF position, the corresponding output will be OFF.
- The POO configuration is shipped with the first 12 outputs (1-12) ON and the last 12 outputs (13-24) OFF.
  - » The first 12 outputs correspond to the default Y-cable configuration, where these outputs are connected to the first 8 vehicle phases (1-8) and 4 ped phases (2, 4, 6, 8).
  - » This way, if the Fusion I/O Board loses power, it will be able to generate a logic low signal to the cabinet/controller, resulting in a Max Recall failure behavior, allowing those phases to be serviced until the equipment can be powered back on or replaced.

7.12. Initial Setup – Left Turn Type and Ped Phases

Prior to syncing the processor with the global InTraffic configuration, when the system is first installed, the Ped Phases and Left Turn Operation will need to be configured via the Initial Setup.

1. Click on the Initial Setup button. The Peds/Left Turn Setup menu opens.

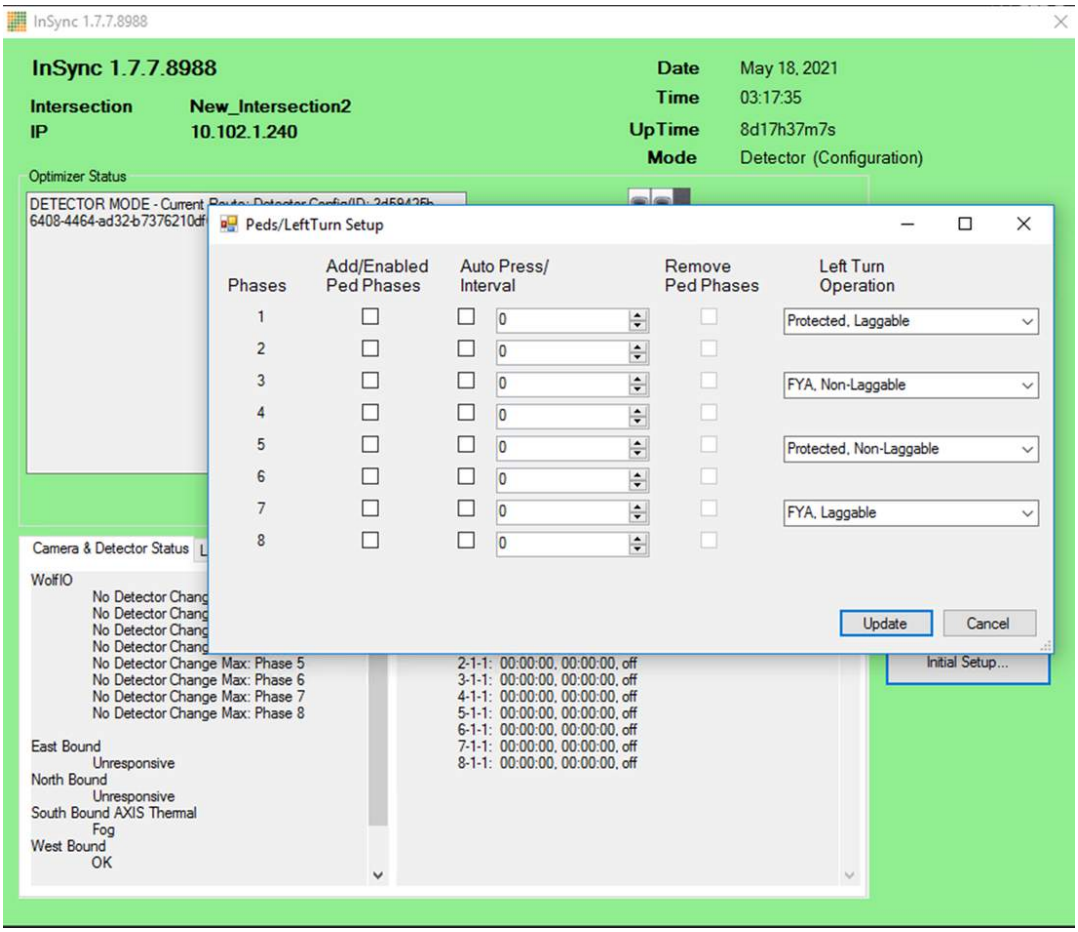


Figure 7-77. Initial setup screen

2. Determine the ped phases that need to be enabled so that InSync can be configured to provide ped detection for those phases.

    a. Add/Enabled Ped Phase – Put a checkmark in the box in case a phase needs to serve pedestrian demand.

    b. Auto Press/Interval – Set the interval for automatic activation of pedestrian service

without pressing the Ped button e.g., 4 seconds. This way the InSync system will send a ped call to the controller every 4 seconds, to allow the controller to periodically service the ped phase. The interval is measured in seconds.

3. Set the Left Turn Operation where applicable for a phase, by selecting an option from the drop-down list:

    a. Protected, Laggable

    b. FYA, Laggable

    c. FYA, (Flashing Yellow Arrow) Non-Laggable

    d. Protected-Permissive, Laggable

    e. Protected-Permissive, Non-Laggable

    f. Protected, Non-Laggable

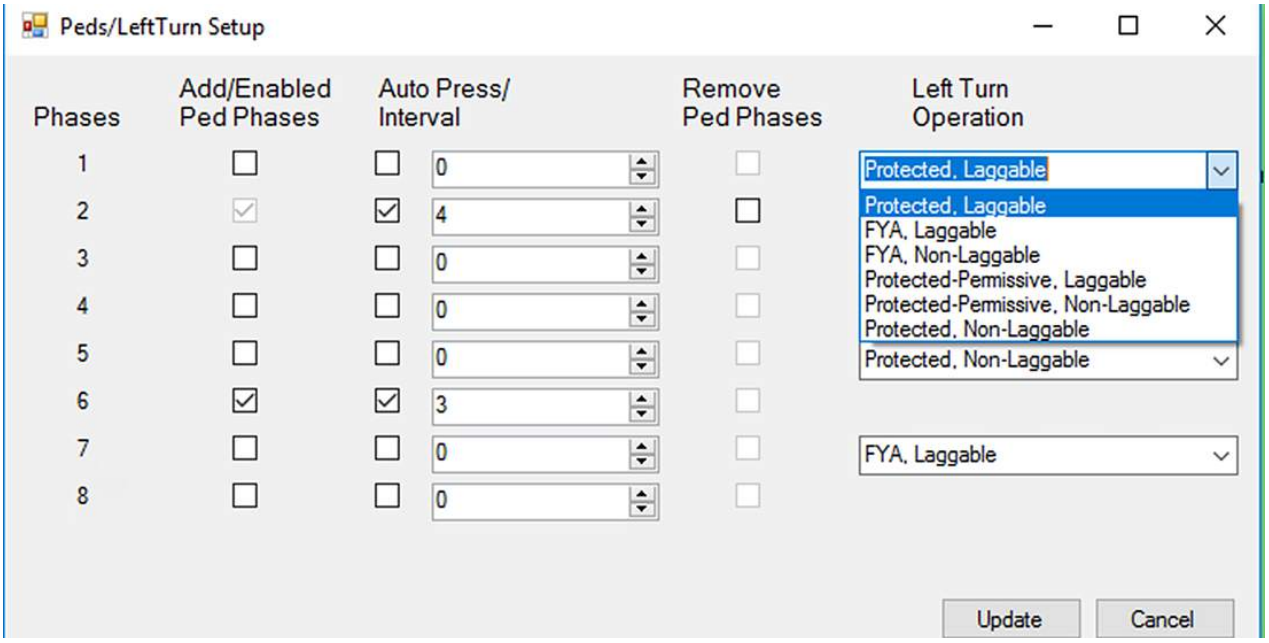


Figure 7-78. Left turn type drop-down list

4. When all settings are in place, click on Update to save the configuration. Left-turn arrows and ped signal, headed by a DON'T WALK sign, get visualized on the intersection schema.

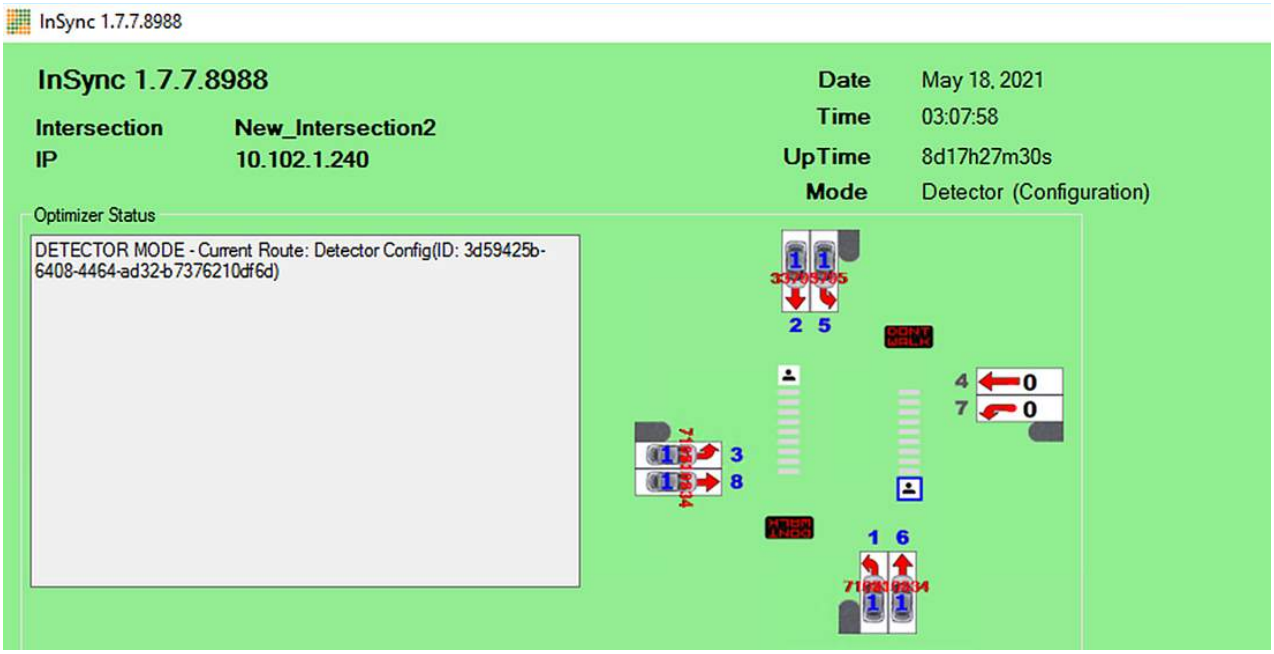


Figure 7-79. Ped phases and left turn visualization dashboard

5. Remove Ped Phases – in case a phase has been pre-set to serve pedestrian demand and you wish to discontinue that function, put a checkmark into the respective box.

Example: Disable pedestrian phase 6 by putting a checkmark in the box aligned with that phase under Remove Ped Phases. Leave only phase 2 to serve pedestrian demand.

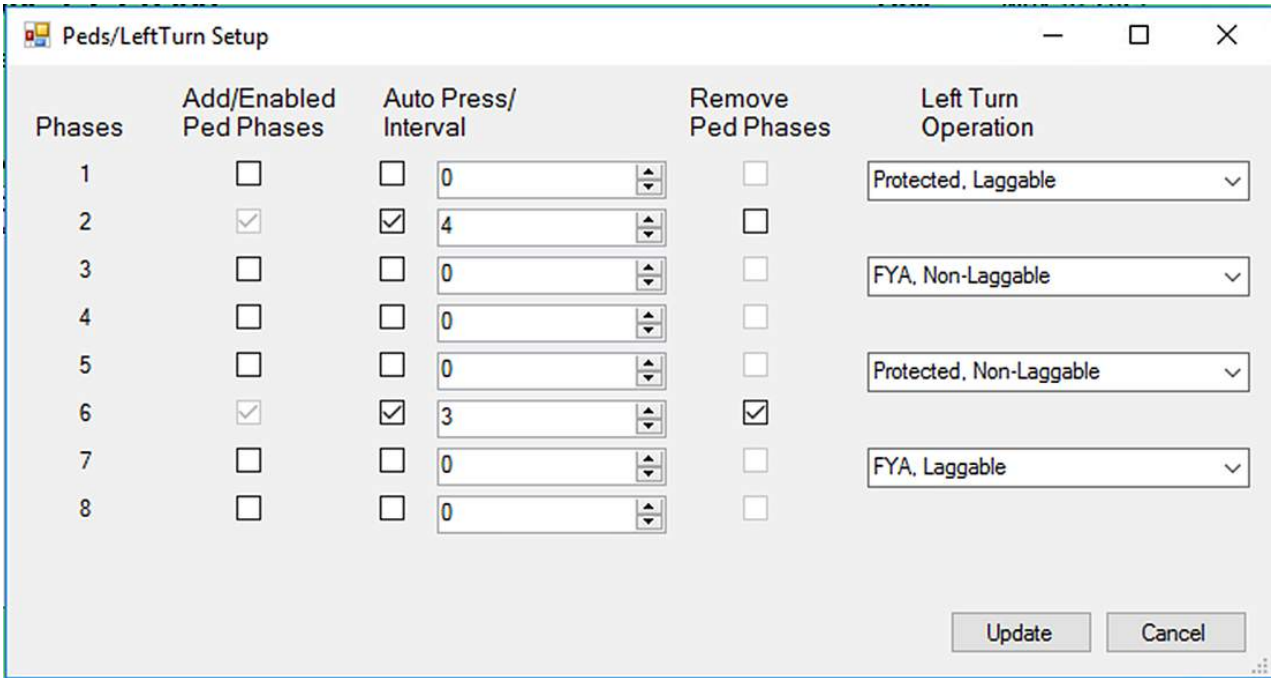


Figure 7-80. Settings for removing a ped phase

6. Click Update – the ped signal will disappear from phase 6 and will only remain in place against phase 2. It may fully disappear if all ped phases are disabled.

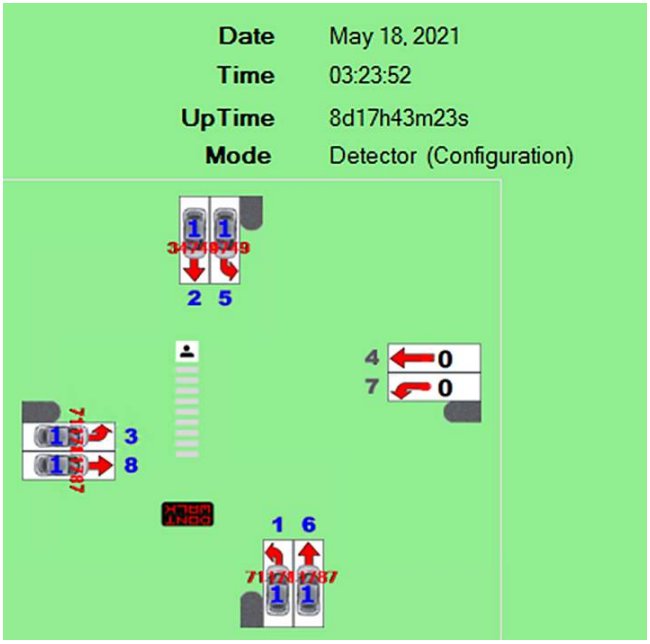


Figure 7-81. Dashboard change after removing a ped phase

The counter of time in the Peds/Preempts/TSP tab, under the Triggered and Sent fields, will change to indicate when a ped signal has been Triggered (received) and when it has been Sent to the controller). In the instance below, the ped input was Triggered last at 3:00:14 and was also sent to the controller at that time.

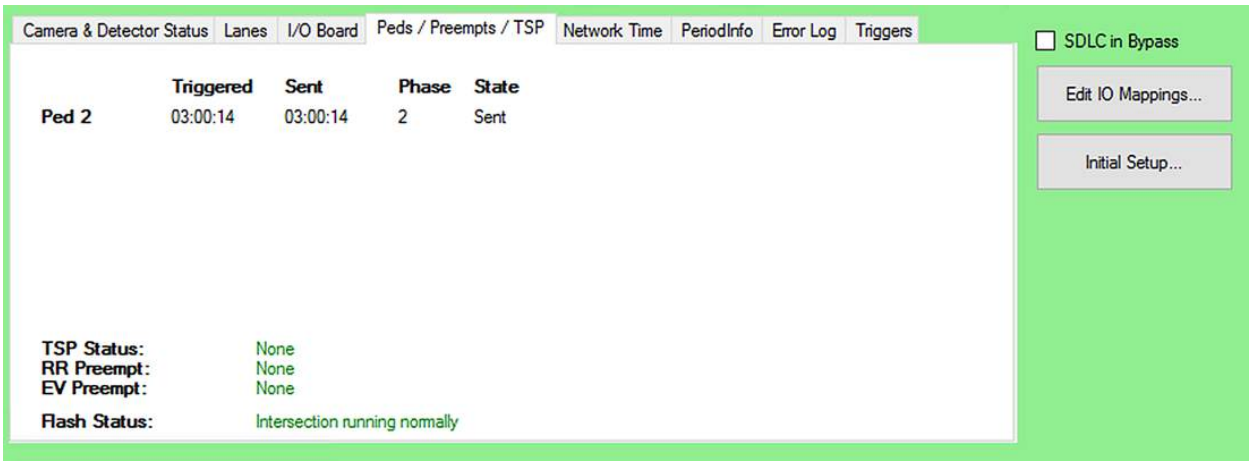


Figure 7-82. Ped call time counter

7. When the global InSync configuration is finally synced to this system, it will override these settings as provided within the InTraffic configuration.

If the InSync system has been synced from InTraffic, the Initial Setup will be disabled, as the Ped Phase and Left Turn Operation configuration is maintained within the InTraffic configuration.

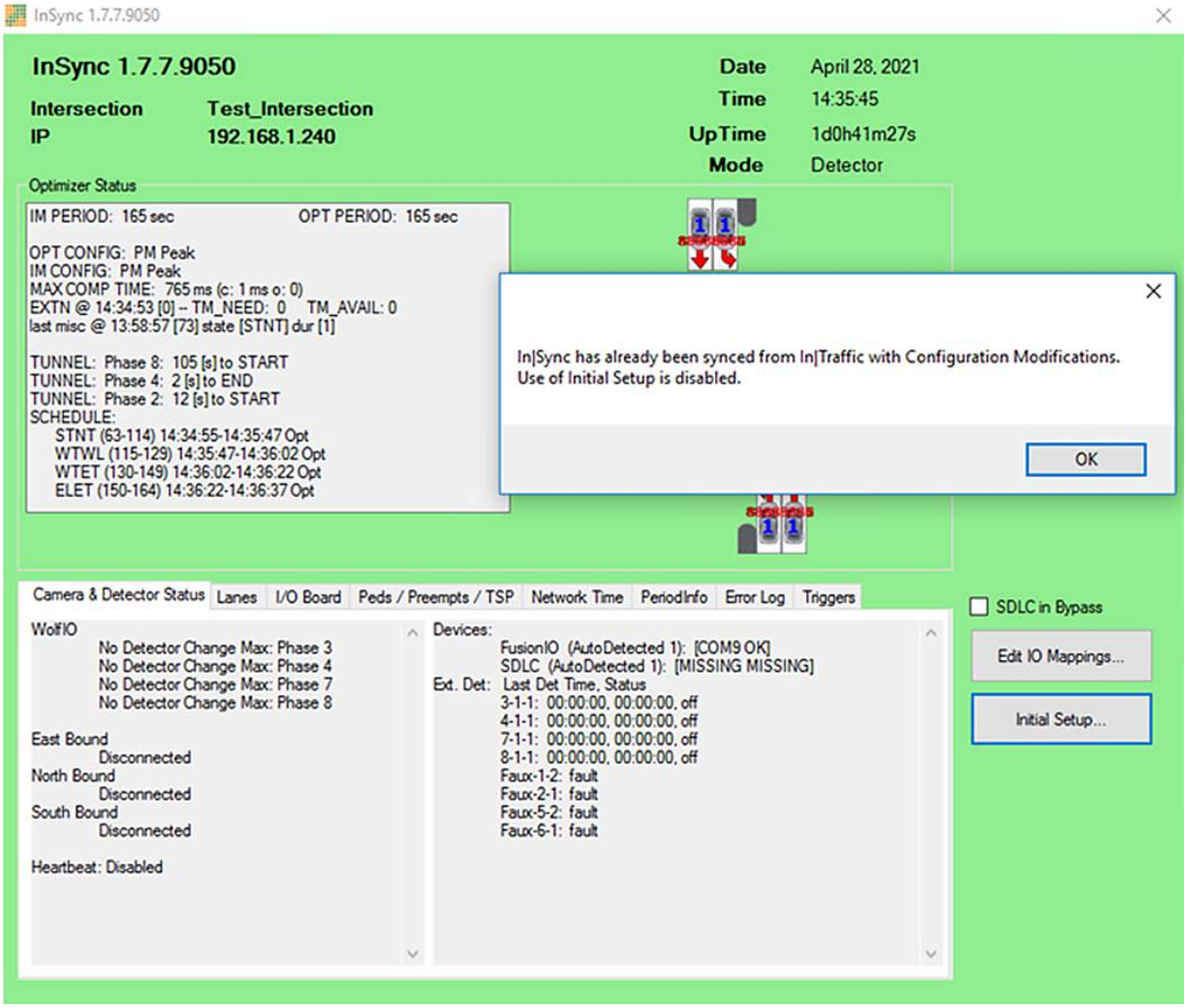


Figure 7-83. Configuration sync-ed alert

Chapter 8. Turning on Adaptive Mode

8.1. Preparing the Controller for Adaptive Mode

After installing In|Sync, we recommend running the system in detector mode for two weeks.

Prior to In|Sync adaptive operation, In|Sync configuration files must be uploaded into In|Sync (via Rhythm Engineering personnel) and you then must make changes to the controller's settings (listed below) to put the controller into free mode. These changes to the controller allow In|Sync to place calls only to the phase pair that In|Sync determines to require service. In|Sync never calls conflicting phases while in adaptive mode.

SETTING	ACTION	REASON WHY
All Recalls (Max., Min, etc.)	Disabled	Coordination based parameters will prevent the controller from operating the intersection based on the calls it receives from In|Sync.
Soft Recall	Enabled on mainline through phases	In Adaptive mode, the local optimizer schedules the appropriate amount of green time for a standing queue. In|Sync cannot serve any phase for less than the Min Green programmed in the controller. These Min Green settings must also be programmed in In|Sync.
Non-locking Memory	Enabled on all phases	Because Max Green times are only used when conflicting calls are present, they are irrelevant during normal adaptive operation.
Detector Delays	Remove all	When In|Sync moves calls to the next scheduled phase pair, there may be a fraction of a second where the controller has no calls due to system latency. In order to remove the possibility of soft recall, we require setting the Gap or Passage time to 1 second.
Protected/ permitted left turns	Omit the left turn call when opposing through movements are gree	When In|Sync moves calls to the next scheduled phase pair, there may be a fraction of a second where the controller has no calls due to system latency. In order to remove the possibility of soft recall, we require setting the Gap or Passage time to 1 second.
Protected Only, Flashing Yellow and Dallas Display Left Turns	Allow lagging left turns	When In|Sync moves calls to the next scheduled phase pair, there may be a fraction of a second where the controller has no calls due to system latency. In order to remove the possibility of soft recall, we require setting the Gap or Passage time to 1 second.
Detector Diagnostics Failure Mode	Enabled	
	Off Failure set to 5 minutes	In|Sync's detector heartbeat pulses call on all phases to the controller periodically to prevent detector diagnostics off failure from occurring. This heartbeat functionality is also a reason why Non-locking Memory must be enabled.

TABLE 9-1. Settings for freeing up the controller

Chapter 9. Changing Equipment Settings

9.1. Changing IP Addresses

Processors and cameras are pre-configured with the appropriate IP address settings when they are shipped. But sometimes it is necessary to change these in the field. This can be easily achieved directly from the processor using a keyboard and monitor.

> ***Note:*** *If you are moving to a new subnet (e.g., from 192.168.10.xx addresses to 10.10.1.xx addresses), you should update the cameras first, then the processor.*

9.1.1. Change the processor's IP address

Change the IP Address at the Kiosk

The Network Parameters dialog box can be used to adjust all the network parameters on a processor. To access the Update Network Settings dialog box.

1. Attach a keyboard and monitor to the processor or access the Kiosk via laptop through RDP.
2. Select the **Settings** tab on the In|Sync Kiosk.
3. Click **Network Settings**. The Update Network settings dialog box displays.
4. The current column displays the current IP address, subnet, gateway and DNS settings for the processor. In the **Change To** column, type the new IP address in its associated field.
5. Continue to update the subnet, gateway and DNS fields in the **Change To** column.
6. Click **Update**.

> ***Note:*** *After you save your changes, you will lose communication with the In|Sync Processor. If you need to re-establish communication with the processor, log back into the processor using the new IP address.*

Change the Processor IP Address within In|Traffic

The final step in updating a processor's IP address is updating the address within the In|Traffic data repository. To update the IP address of an In|Sync Processor:

1. Open the **Device Management** tool from the In|Traffic page. The Device Management page displays.
2. Select the processor in which you want to change the IP address or serial number. The Device Details page displays.

> ***Note:*** *To narrow the amount of devices that display, you can search for the device by name, IP-address or serial number or you can filter which devices display based on whether or not the device is assigned to an intersection or based on the device type.*

3. Type the new IP address in the **IP Address** field.
4. Click **Save** from the top navigation bar.
5. Go back to the In|Traffic main page.
6. Open the **Configuration Management** application.
7. Select the management group to which the In|Sync Processor belongs.
8. Select **Sync this Management Group to Devices** from the Save pull-down menu.

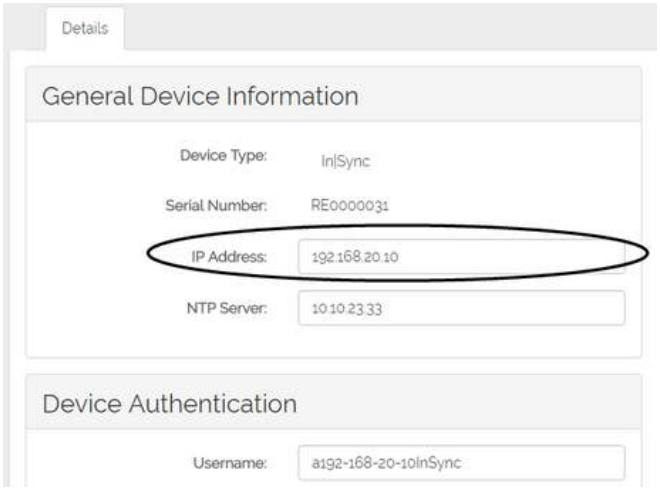


Figure 9-1. Change IP address field

9.1.2. Change a Bosch camera's IP address

There are two steps to changing a camera's address. First, you have to set the address of the camera at the camera and then you have to adjust the In|Sync configuration so it communicates with the camera via the new address.

> ***Note:*** *For instructions for changing an Axis camera's IP address, go to "In|Sync Troubleshooting".*

Set the camera's IP Address

> ***Note:*** *The following steps must be done from a computer, not from a processor.*

1. Open a web browser (such as Internet Explorer) on your computer.
2. Type the current camera IP address in the browser's Address Bar and press [ENTER].
3. Type admin in the **User Name** field.
4. Type 4321 in the **Password** field.
5. Click **OK**. The Live Viewer screen displays.

> ***Note:*** *If your PC has not installed Silverlight Runtime or has just installed an old runtime version, you will be redirected to the Silverlight Runtime installation page automatically when accessing the web viewer. Install this plug in, close and restart the browser window and re-log in to the camera.*

6. From the Setup () menu, select the Network () tab.
7. Click **Interface**.
8. Under IP Type, click **Manual**.
9. Set the IP address, Subnet mask, Gateway, DNS1 and DNS2 to the new values.
10. When done, click **Apply** (). The camera is now set to the new IP address.

> ***Note:*** *Default router is the same as a "Default Gateway" or "Gateway Address."*
> ***Note:*** *After you click Apply, you will lose communication to the camera. As In|Sync loses communication for each camera, In|Sync will default to using historical data for the vehicle phases associated with each camera.*

9.1.3. Adjust the In|Sync Configuration in the Configure Detectors Utility

After assigning the new IP address on the camera, you must adjust In|Sync so that it looks for the camera's new IP address. To do that from the In|Sync Processor:

1. Plug in the monitor and keyboard to the In|Sync Processor, if it is not already plugged in. The In|Sync Kiosk displays on the monitor.
2. Click the **Configure Intersection** button on the Home screen. The Configure Detector dialog box displays.
3. Select the direction of the new camera from the **Direction** drop-down list box.
4. Make sure the **Camera** tab is selected.
5. Select the name of the new camera from the Camera drop-down list box.
6. Click the Edit Camera ( ) button. The Edit Camera dialog box displays.

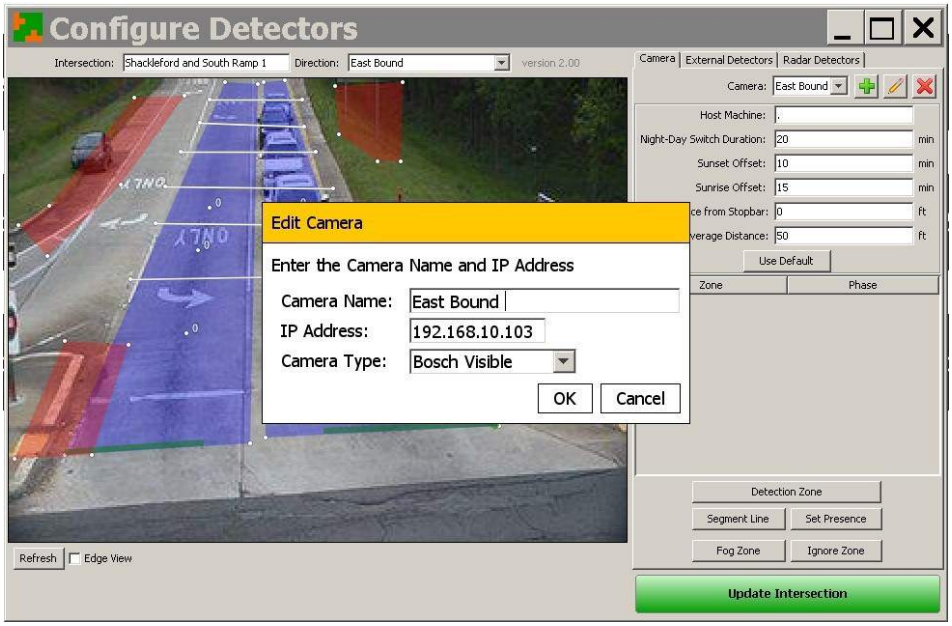


Figure 9-2. Changing the IP address of an In|Sync Camera

7. Type the new IP address in the IP Address field and click **OK**.
8. Click the **Update Intersection** button.

If you are accessing the intersection from the In|Sync WebUI:

1. Open a web browser, such as Internet Explorer.
2. Type the processor's IP address in the browser's Address bar and press ENTER.
3. Type in your user name and password into its associated fields.
4. Select **Configure Detectors** from the Settings menu.
5. Select the direction of the new camera from the **Direction** drop-down list box.
6. Make sure the **Camera** tab is selected.
7. Select the name of the new camera from the **Camera** drop-down list box.
8. Click the **Edit Camera** () button. The Edit Camera dialog box displays.
9. Type the new IP address in the **IP Address** field and click **OK**.
10. When finished, click **Update Intersection**.

9.1.4. Adjust the In|Sync Configuration within In|Traffic

The final step in updating a cameras IP address is updating the address within the In|Traffic data repository. To update the IP address of an In|Sync detection camera:

1. Open the **Device Management** tool from the In|Traffic page. The Device Management page displays.
2. Select the device in which you want to change the IP address or serial number. The DeviceDetails page displays.

> *Note: To narrow the amount of devices that display, you can search for the device by name, IP address or serial number or you can filter which devices display based on whether or not the device is assigned to an intersection or based on the device type.*

3. Type the new IP address in the **IP Address** field.
4. Click **Save** from the top navigation bar.

5. Go back to the In|Traffic main page.
6. Open the **Configuration Management** application.
7. Select the management group to which the In|Sync detection camera is located.
8. Select **Sync this Management Group to Devices** from the Save pull-down menu.

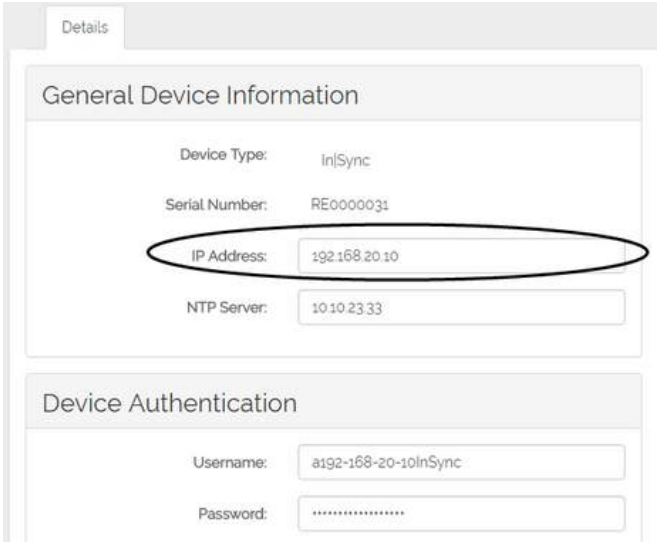


Figure 9-3. Change IP address field

Chapter 10. Intercepting Pedestrian/ Auxiliary Calls

10.1. Using the Intercept Module

In addition to detecting vehicles, In|Sync can take other traffic needs into consideration, such as pedestrian calls, emergency vehicle preemption (EVP) and other auxiliary inputs and outputs that In|Sync may not be connected to using the provided cables.

The Intercept Module's 8 auxiliary inputs provides In|Sync with the ability to receive more inputs than what is available through the SDLC interface module. It also allows you to send additional signals out on the 8 auxiliary output pins. For instance, we can use an auxiliary output to send a signal to a pin in the event that you have a backup timing plan you want used during a communication or power failure. See page 169 for instructions on setting up a free mode pin.

The Intercept Module is used for incorporating pedestrian calls into In|Sync's adaptive coordination. For example, when a person pushes a pedestrian button, In|Sync receives the call and holds it until the optimal time to serve it in conjunction with vehicular movements. The Intercept Module also enables In|Sync to monitor EVP so that it can respond efficiently to EVP. In|Sync then gradually resumes adaptive coordination after the call is served.

The Intercept Module serves several purposes:

- To provide 8 additional/auxiliary inputs and outputs that can be 12 VAC or 24 VDC referenced
- To incorporate pedestrian signals
- To monitor EVP

The Intercept Module has eight field inputs and eight field outputs, which are split into two banks: Bank 1 and Bank 2. Each bank requires that any inputs or outputs connected to it must use the same voltage reference and common.

There are four groups of status LEDs:

- Power LED: solid green means power is on
- Status LED:
  - » Off means the serial mode switch on the module's back is set to off
  - » Blinking means that the Serial mode switch is set to on, but there is no communication with the module
  - » Solid means the serial mode switch is set to on and there is good communication with the device.
- Bank 1-4 Input LEDs: solid green means an input signal has been received
- Bank 1-4 Output LEDs: solid green means an output signal is being sent

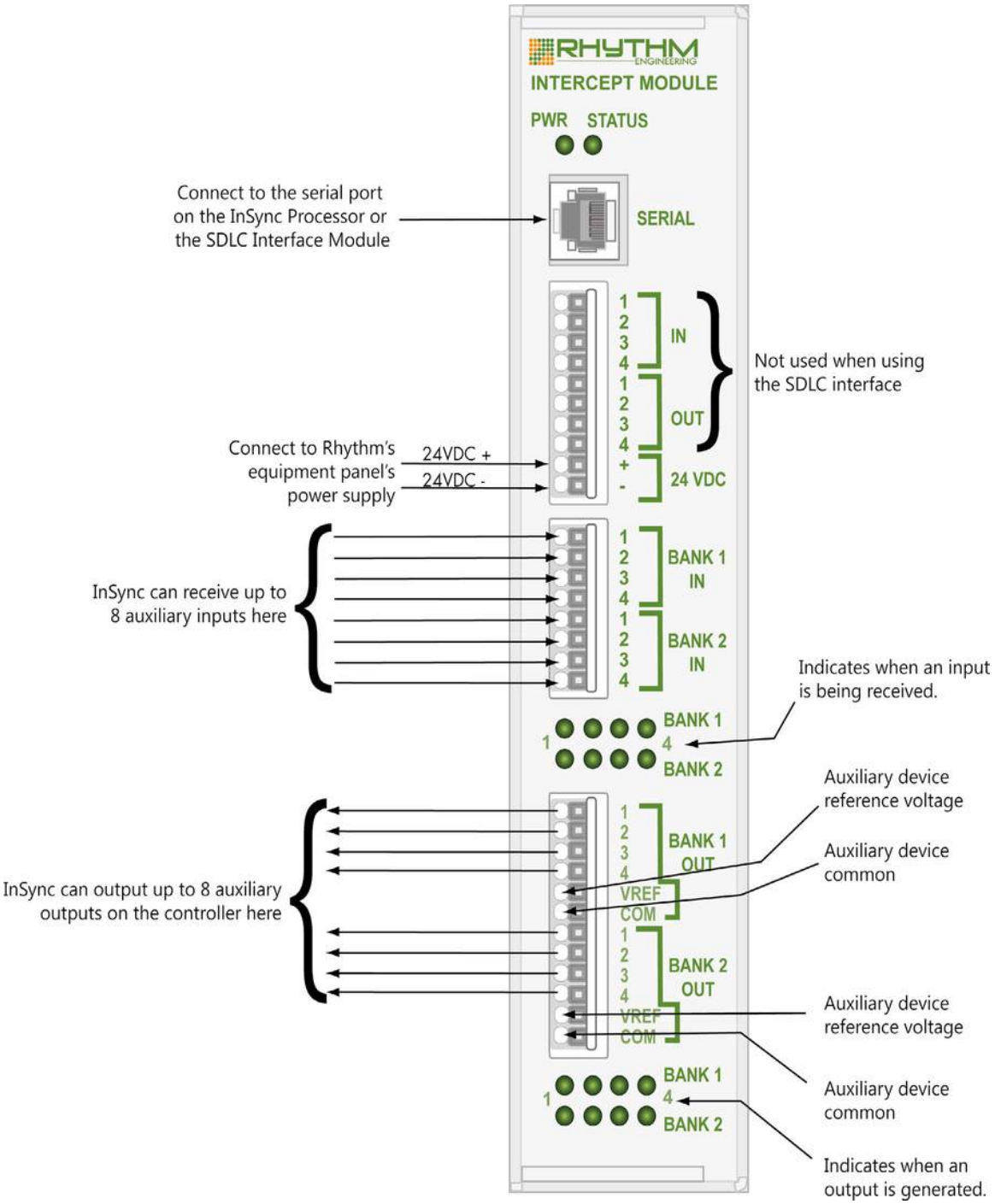


Figure 10-1. Intercept Module Connectors

10.2. Intercept Module Installation Checklist

Quick installation checklist

Use the following checklist for the purpose of wiring pedestrian inputs and outputs for pedestrian interception:

- ☐ Verify that ALL Ped buttons are working before installing the Intercept Module.
- ☐ Install and secure the Intercept Module
- ☐ Locate/identify Ped button COMMON (i.e., DC LG or AC -:_____
- ☐ Locate pedestrian field wiring inputs:

Determine if a Ped isolator is installed in the traffic cabinet. If a Ped isolator is installed, then it is important to wire the Ped inputs and outputs interfaced with the Intercept Module between the Ped isolator and traffic controller. You will also want to reference the VREF and Common that the Ped isolator uses to send signals to the controller.

- Phase 2:_____
- Phase 4:_____
- Phase 6:_____
- Phase 8:_____

- ☐ Measure reference voltage from Ped button active terminal to Ped button COMMON:
- ☐ Locate the reference voltage source (VAC terminal, 24 VDC terminal, OPTO COM terminal).
- ☐ Connect the voltage reference to BANK 1 VREF.
- ☐ Connect Ped button COMMON (location found above) to BANK 1 COM.
- ☐ Connect Terminal 1 of BANK1 IN to the spare terminal location (or field wire) to allow In|Sync to receive the pedestrian button field wire's active signal.
- ☐ Connect Terminal 1 of BANK1 OUT to the terminal allowing In|Sync to send a pedestrian call to the traffic controller.

Alternately, you can splice and crimp the PED In field wire to the Intercept Module In wire

- ☐ Test each pedestrian phase and button after wiring each one into the Intercept Module.
- ☐ Connect power to the Intercept Module. Contact Rhythm to finalize setup/complete validation.

10.3. Installing Pedestrian Interception

The most common use for the Intercept Module is for incorporating pedestrian calls into In|Sync's adaptive coordination. The following steps detail how to connect the Intercept Module to your Ped buttons.

10.3.1. Tools needed

Be sure to have the following tools available:

- Multi-meter for measuring reference voltages and locating devices connected to the cabinet
- Crimping tool
- Wire strippers
- Phillips and slotted screw driver
- Barrel/butt crimp connectors
- 18-22 AWG wire in multiple colors
- Spade connectors

The Intercept Module only supports 16-24 AWG wire. Use a barrel crimp connector to take any larger gauge wire down to 18 AWG.

Make sure that no strands of wire come out of the terminals, which could cause shorts to neighboring terminals.

10.3.2. Overview

For more detailed instructions, refer to the directions beginning on page 151.

To install an Intercept Module:

1. Verify that all Ped buttons are currently working at the intersection by manually activating them.

2. If there is an active pedestrian demand, make sure that Ped Recalls are activated or that someone is assigned to manually place calls to service pedestrian demand.
3. Locate the Ped button's COM and Active wires in the cabinet and measure the voltage reference.
4. Connect the cabinet's COM and VREF sources to the Intercept Module's COM and VREF terminals for whichever BANK you are connecting into.
5. Disconnect the first PED (i.e. phase 2) field wire from its original terminal location (i.e. side panel or back panel).
    a. If possible, relocate the Ped field wire to an open terminal.
    b. If not possible, proceed to step 6.
6. Connect Terminal 1 from BANK1 IN to the Ped (i.e., phase 2) wire (In|Sync receives pedestrian calls from field wires/push button here).

OR

Splice and crimp together the PED field wire to the Intercept Module In wire.

7. Connect Terminal 1 from BANK1 OUT to the original terminal location (In|Sync places pedestrian calls to traffic controller here) where the Ped (i.e., phase 2) field wire was located.
8. With the Intercept Module off (deliberately), test the Ped button to verify that a signal is being passed from the push buttons in the field to the controller.
9. Repeat steps 5-8 until all Ped buttons are installed and verified to be working.
10. Connect the Intercept Module to the In|Sync Processor and set the communication mode on the Intercept Module to Serial (see "Set the communication mode" on page 154.).
11. Connect the Intercept Module to the equipment panel's power supply.
12. Contact Rhythm Engineering to configure setup and test inputs/outputs.

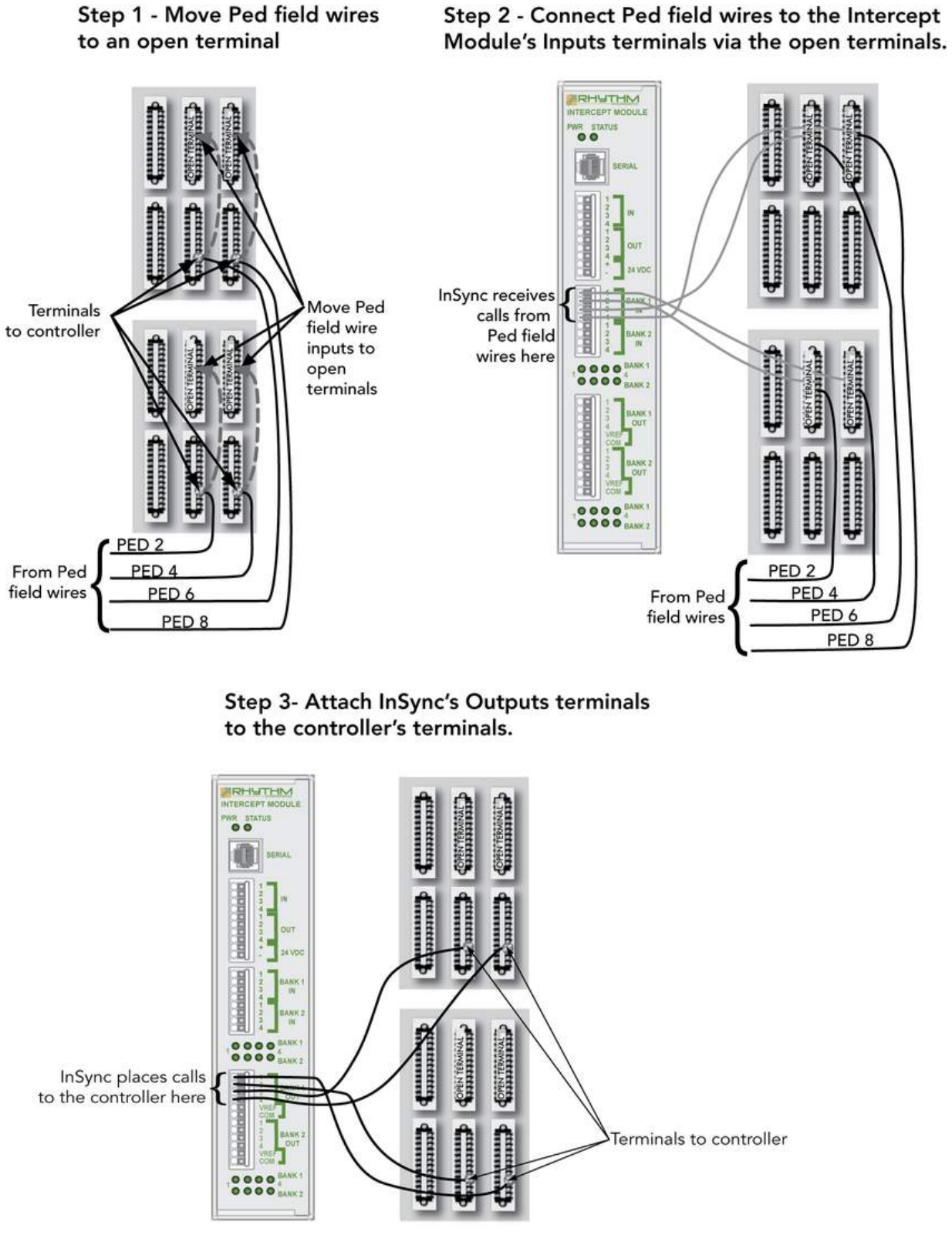


Figure 10-2. Field wiring when using a spare terminal

Locate COM And Active Signal Wires

1. Consult the cabinet blueprint or documentation to ensure that the correct reference voltage source and common is identified.
2. Locate the Ped button's common (COM) voltage reference (i.e., AC Neutral, LG, etc.).
3. Locate the Ped button's active signal in the cabinet.
4. Determine the reference voltage applied to the Ped button. To do this, use a multi-meter and measure the voltage from the active terminal to the common. Record this reference voltage.

Locating the source of the reference voltage may be challenging. Typically, in NEMA TS2 Type 1 cabinets, the Ped button reference voltage may be called OPTO COM, which is the reference voltage used for the optically isolated inputs (the Ped buttons) to the terminals and facilities BIUs.

- Common voltage reference 332 - 24VDC
- NEMA TS1 or TS2 Type 2 - 24VDC
- NEMA TS2 Type 1 - 12 or 12 VAC

Connect COM And VREF Wires To The Intercept Module

BANK 1 uses one voltage reference for all four inputs and outputs, BANK 2 has the capability to use another if required. It is not possible to use more than one voltage reference on BANK 1 or Bank 2 individually.

1. Measure and cut two strips of 16-24 AWG stranded or solid copper wire long enough to connect from the Intercept Module to the COM and VREF sources (i.e., terminals located on backpanel, etc.).
2. Strip ⅜ to ½" of insulation from both sides of the two wires.
3. Take one end of a wire and insert it into the Intercept Module's BANK1 OUT COM terminal as shown in Figure 11-3, "Connecting Common and Voltage References to Intercept Module," on page 173.
4. The Intercept Module's spring connect grabs the bare wire. When you tug on the wire, it should not pull out.

5. To remove an inserted wire, press the white release button above the wire insertion opening.
6. Attach a spade connector to the other end of the wire.

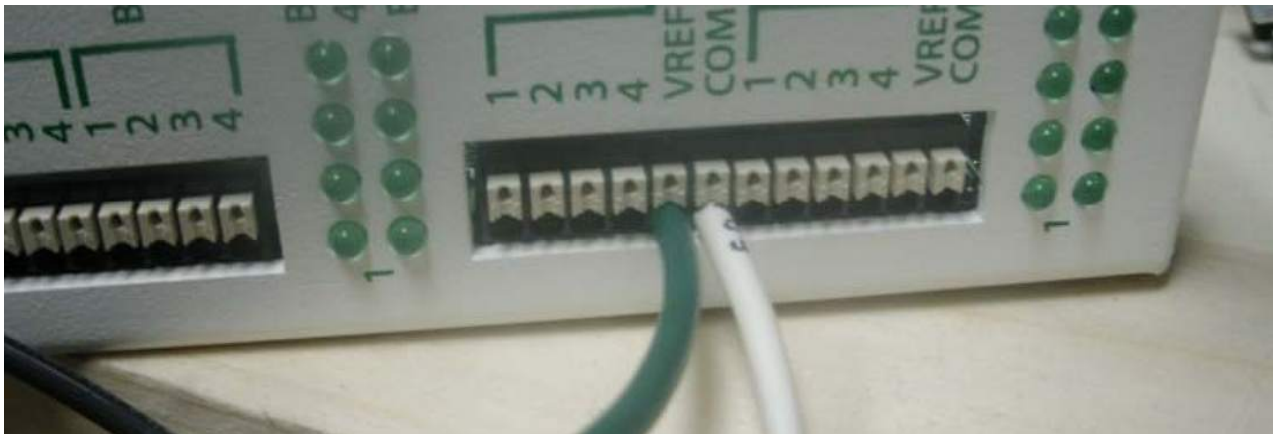


Figure 10-3. Connecting Common and Voltage References to Intercept Module

7. Connect the spade connector to the Ped button's COM reference.
8. With the other wire, insert the bare wire into the terminal marked BANK1 VREF on the Intercept Module.
9. Attach a spade connector to the other end of the wire.
10. Connect the spade connector to the Ped button's VREF (voltage reference).

In this example, the COM reference was connected to the AC NEUTRAL bar (same as the Ped button) and the VREF was connected to the BIUs OPTO COM terminal.

Connect Inputs And Outputs To The Intercept Module

In|Sync interfaces with active pedestrian phasing by receiving the active signal from the pedestrian push button into BANK 1 IN of the Intercept Module and sending pedestrian calls to the controller via BANK 1 OUT of the Intercept Module.

INPUTS

1. Identify which pedestrian phase you want to start with and locate the pedestrian field (active signal) wires and terminal(s) associated with this pedestrian phase in the traffic cabinet (i.e., ped phase 2).

2. Using a screwdriver, remove the Ped button's field (active signal) wire(s) from this terminal.
3. Connect the pedestrian button's field (active signal) wires to the Intercept Module by:
    - Connecting the Ped button active signal using a spare terminal:
        a. Move the pedestrian button's field (active signal) wire to a free/unused terminal.
        b. Connect Terminal 1 of BANK 1 IN to the spare terminal location to allow In|Sync to receive the pedestrian button field wire's active signal.

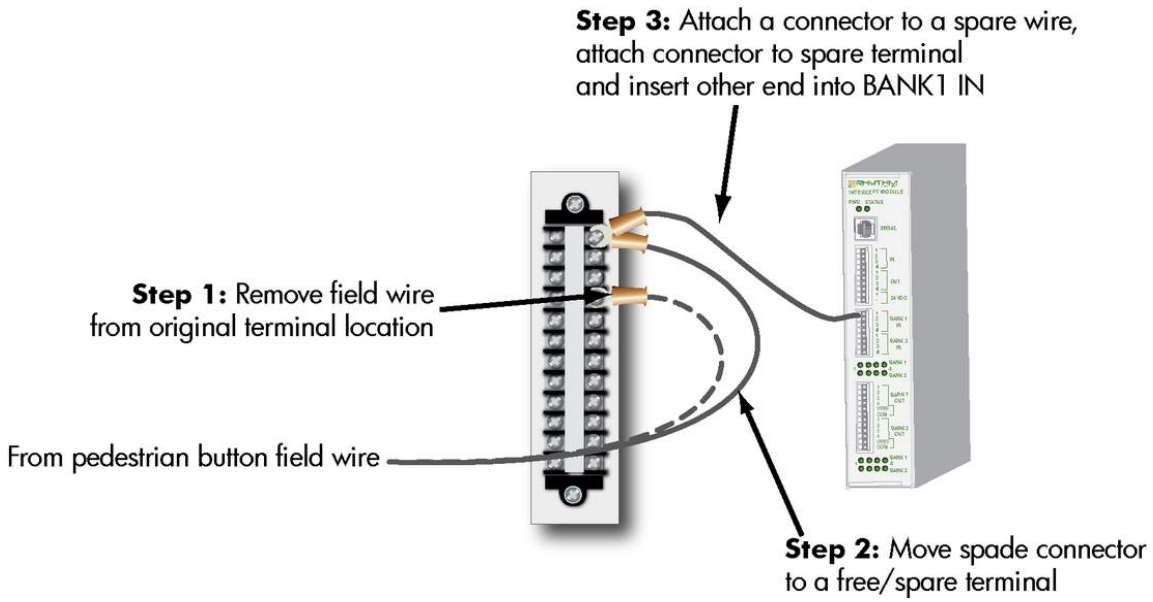


Figure 10-4. Input Wiring Method 1

- Connecting the Ped button field (active signal) wire directly to the Intercept Module:
    a. Use a barrel crimp connector to add/extend the pedestrian field wire to reach the Intercept Module and connect/insert the wire into terminal 1 of BANK1 IN.

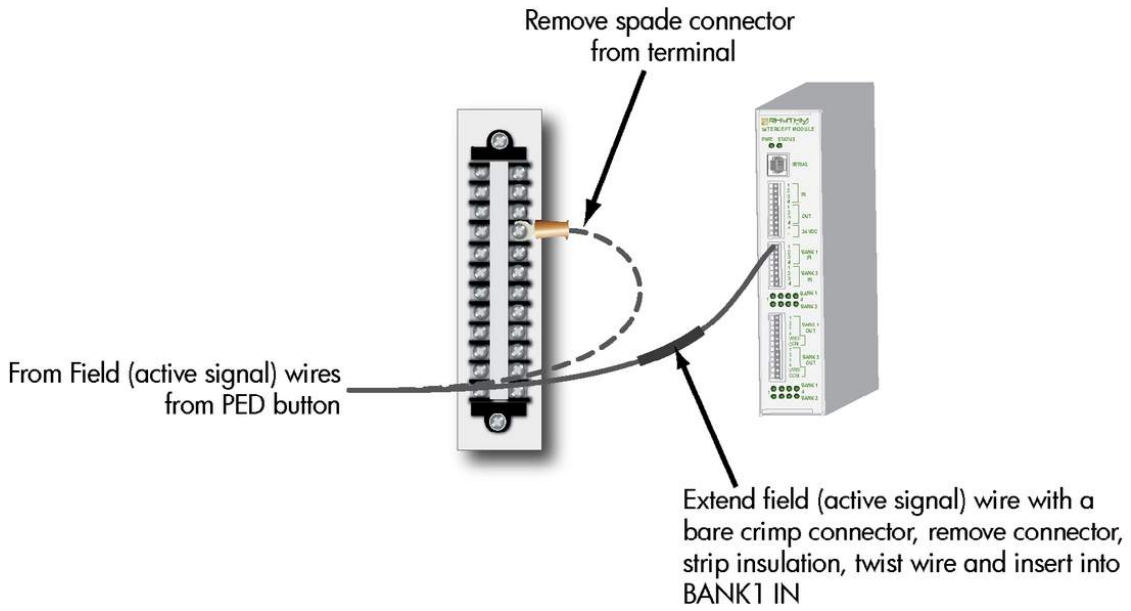


Figure 10-5. Input Wiring Method 2

OUTPUTS

1. Measure and cut a piece of wire that extends from the backpanel to the Intercept Module.
2. Connect terminal 1 of BANK 1 OUT to the terminal allowing In|Sync to send a pedestrian call to the traffic controller.

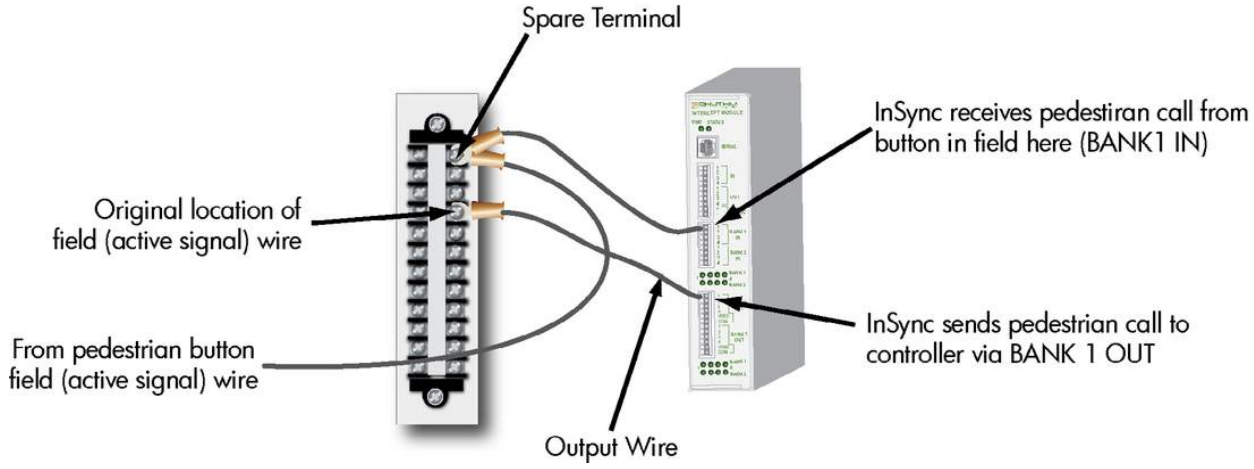


Figure 10-6. Finished Wiring Method 1

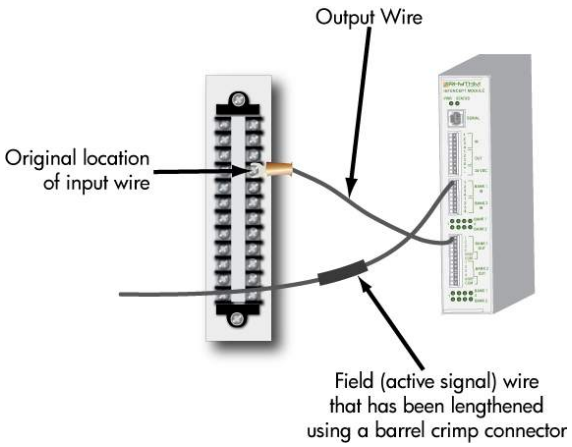


Figure 10-7. Finished Wiring Method 2

3. Verify that the Ped button still functions correctly by testing the pedestrian push buttons. The device should operate exactly as before. If the signal is not received, check loose connections and use a multi-meter to verify proper connections.

4. Repeat steps 1 through 4 for the rest of the pedestrian buttons.

Set The Communication Mode

In|Sync communicates with the Intercept Module using a serial communications cable. To set communications between the processor and the Intercept Module:

1. Install the Rhythm-provided serial cable between the serial port on the In|Sync Processor and the Rhythm Intercept Module.

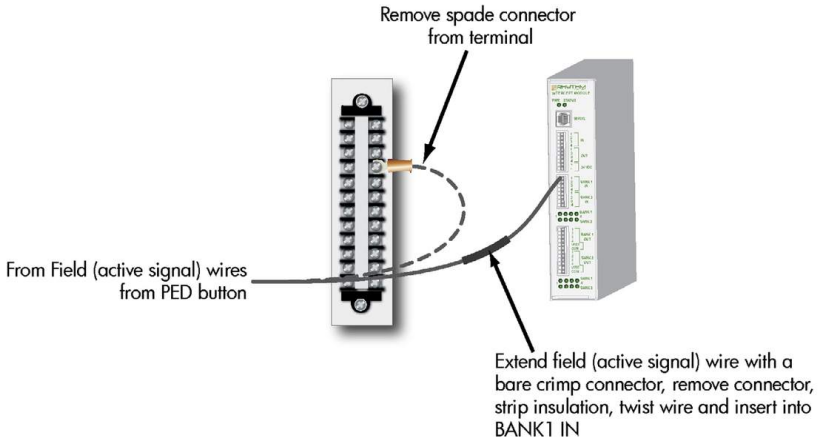


Figure 10-8. Connect the In|Sync Processor to the Intercept Module

2. If you are using the SDLC, then you must use a serial Y-cable to connect both the Intercept Module and the SDLC Interface Module to connect to the In|Sync Processor.
3. Flip the small switch to the down position on the back of the Intercept Module (when oriented vertically as shown in the previous figure. This puts the Intercept Module into Serial mode.

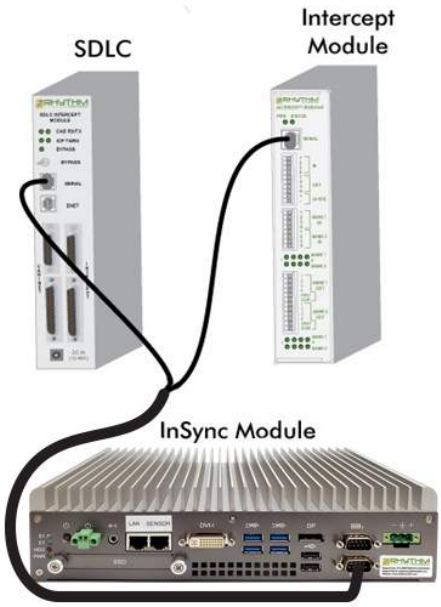


Figure 10-9. Connect the In|Sync Processor to the Intercept Module and SDLC Inferface Module

10.4. Connect the Intercept Module to Power

Providing power to the Intercept Module is intentionally the last step. The Intercept Module is designed to pass calls/signals straight through when powered off, which is how it should be wired and tested to confirm proper wiring and functionality before providing power to the Intercept Module.

The Intercept Module is powered by the 24VDC power supply on the In|Sync Equipment Panel. To connect power to the Intercept Module:

The terminals only support 16-24 AWG wire. Anything larger or smaller requires a barrel crimp connector and correctly sized wire.

1. Bond the 24VDC+ terminal on the Intercept Module to the 24VDC+ terminal on the In|Sync Equipment Panel.

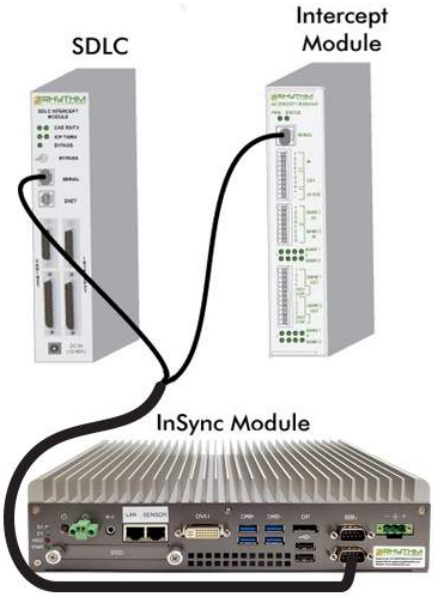


Figure 10-10. Connecting Power to the Intercept Module

2. Bond the 24VDC - terminal on the Intercept Module to the 24VDC - terminal on the In|Sync Equipment Panel.

> ** You may connect the Intercept Module power connectors to terminals 7-10 on the Equipment Panel's DC+ and DC- terminal blocks.*

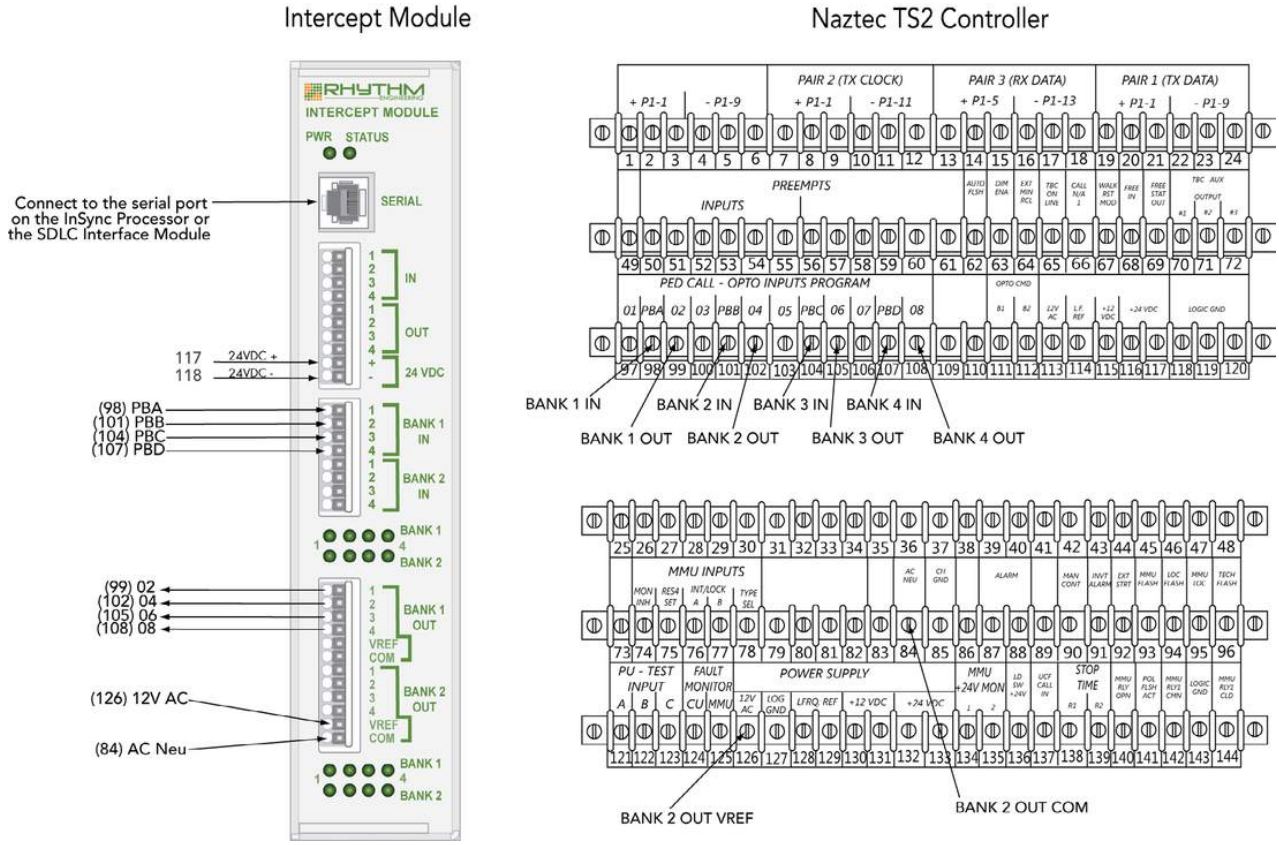


Figure 10-11. Connection locations between the Intercept Module and a Naztec TS2 Controller

Verify The Input In In|Sync

The next step is to contact Rhythm Engineering to complete the setup of the pedestrian inputs/outputs within In|Sync and then test them. Contact Rhythm Engineering at (913) 227–0603 to complete the setup.

Remote communications/access must be enabled for Rhythm to be able to access the system remotely in order for Rhythm to assist with remote configuration and the final setup/validation of the Intercept Module.

Chapter 11. Checklists

The following checklists are designed to aid you in your installation of an In|Sync system and help you maintain it as long as possible. Feel free to tear these checklists out of your manual or to download a printable copy that you can keep handy for reference.

11.1. Installation Checklist



Step #	Installation Steps	Date Completed	Installation Guide Reference
1	**Receipt of Shipment**		
	a) Check packaging upon arrival (if damaged take pictures)		
	b) Report missing/damaged items within 30 days of receipt		
2	**Infrastructure meets network requirements**		Chapter 2 - Establish Network Communications p. 15
3	**Communications to the cabinet are in place**		
	a) Cat6 cable is run and terminated per specs		Chapter 4 - Installing the Hardware > Terminate Power and Ethernet Connections at Camera Location p. 54
	b) Cat6 cable run is tested with Fluke Micro Scanner or similar device ***Note:*** *If a Cat6 cable is plugged into the camera* *before being tested, the warranty is null and void*		Chapter 4 - Installing the Hardware > Validating Connections p. 73
	c) Rhythm approved Ethernet repeaters installed, if needed		Chapter 2 > Installing an Ethernet Repeater p. 26
4	**All cameras mounted at designated locations**		Chapter 4 - Installing the Hardware > Installing the Video Detection Cameras p. 52 and 66 (Thermal)
5	**In|Sync System Grounded**		Chapter 4 - Installing the Hardware > Grounding the In|Sync System p. 70
6	**Cabinet materials are in the cabinet**		
	a) Equipment Panel - mounted		Chapter 4 - Installing the Hardware > Connect the Equipment Panel p. 61
	b) Processor - mounted & connected		Chapter 4 - Installing the Hardware > Connecting the Processor p. 71
	c) C1-Y, ABC-Y, SDLC, or ATC cable unconnected		
	d) DIN Relay IV - mounted (if applicable)		

Step #	Installation Steps	Date Completed	Installation Guide reference
	e) If SDLC connection include the following		Chapter 8 - Connecting to Controller > Connecting via SDLC Intercept Module p. 127
	SDLC Module - mounted & unconnected		
	SDLC Power Cable		
	SDLC Cable to BIU 1		
	SDLC Serial Cable or Dual Serial Cable		
6	f) If ATC connection include the following:		Chapter 8 - Connecting to Controller > Connecting via SDLC Intercept ITS Module p. 124
	SDLC Module - mounted & unconnected		
	SDLC Power Cable		
	SDLC Serial Cable		
	ATC/ITS Input Cable		
	ATC/ITS Output Cable		
	g) Intercept Module - mounted **(if applicable)**		Chapter 11 - Intercepting Pedestrian/Auxiliary Calls p. 190
7	**Configure a laptop for network communications - processor has correct IP address, subnet mask, gateway, etc.**		Chapter 5 - Configuring a Laptop to Access the Network p. 74
8	**Phasing within the controller must coincide with the signal plans provided**		Chapter 8 - Connecting to Controller > Default Inputs and Outputs p. 147
9	**Camera views checked and adjusted**		Chapter 6 - Adjusting the In|Sync Detection Cameras p. 80
10	**Verify completion of readiness with Rhythm**		
	a) email PMO@rhythmtraffic.com for project planning		
	b) email info@rhythmtraffic.com for assistance and troubleshooting		

Figure 11-1. Installation Checklist

11.2. Final Validation Checklist

Intersection:		Processor S/N:	
Corridor:		In|Sync FW:	
Install Date:		Bosch FW:	

- ☐ Number of In|Sync network cameras: _____
- ☐ Confirm camera views
- ☐ Confirm camera settings & FW
- ☐ Configure In|Sync WebUI vehicle detection setup

Choose IO Connection Method(s)

- ☐ Detector Card
- ☐ ABC Y-Cable
- ☐ SDLC
- ☐ Spade
- ☐ C1 Y-Cable
- ☐ Intercept Module
- ☐ Document and configure all intersection phasing setup
- ☐ Configure and verify light status + Amber/Red times
- ☐ Configure and verify pedestrian settings
- ☐ Configure and verify external detectors (if used)
- ☐ Configure and verify edit mappings
- ☐ SDLC only: Set FusionIO as a Required Device in Edit IO Assignmants with SDLC Module
- ☐ Configure and verify EVP inputs
- ☐ Configure and verify "Fusion Default Outputs"
- ☐ Confirm I/O board communications status in In|Sync dashboard (for all I/O boards in use)
- ☐ Confirm Mode Switch: Adaptive Mode Allowed
- ☐ Confirm POS DIP switches are sent correctly (not in the "middle")
- ☐ Verify system time and time zone, NTP server: _____
- ☐ Verify green returns
- ☐ Test calls to controller
- ☐ Test remote access to and functionality of DIN Relay
- ☐ Confirm cabinet grounding and bonding is compatible with In|Sync connection type
- ☐ SDLC only: Bypass is set in In|Sync as on. Bypass switch is turned off.

11.3. Preventative maintenance checklist

Preventative maintenance tasks that can be performed every 6 months or as needed after inclement weather include:

- ☐ Remotely check camera views via the In|Sync WebUI.
- ☐ Validate that the In|Sync camera(s) is performing properly.

> ***Note:*** *Functionality will typically be noticed throughout the year as the client observes traffic. Email notifications can be enabled to alert the appropriate contacts when necessary.*

Preventative maintenance tasks that can be performed every 12 months or as needed include:

- ☐ Confirm In|Sync connections to ensure the connectivity of In|Sync equipment.
- ☐ Use a compressed air dust cleaner to clean exposed electrical components of the equipment panel and processor.
- ☐ Validate that In|Sync is passing calls to the controller effectively.

Refer to the following pages for more procedures:

- ☐ Go through the Final Field Validation Checklist on page 161 to validate proper system operations.
- ☐ Refer to the In|Sync WebUI User's Guide for information regarding working with detectors via the In|Sync WebUI.

This is not a required checklist to ensure the continuous operation of In|Sync, but rather suggested ways to keep the system performing well. The primary operating health of In|Sync is reliant upon the attention given to the system and its subcomponents during installation. Rhythm Engineering goes to great lengths to properly train and inform the client's personnel and contractors responsible for In|Sync's initial deployment and camera up-keep.

Chapter 12. In|Sync Troubleshooting

12.1. Placing a Vehicle Phase into Recall

If there are any problems at any of the In|Sync system locations, please notify Rhythm Engineering before placing phases in recall.

- Rhythm office @ 913-227-0603 during standard business hours 8 am to 5 pm (CST), Monday through Friday
- 24/7 support line @ 1-913-6RHYTHM (1-913-674-9846)

This way Rhythm can assist in diagnosing the issue; it may not be necessary to place any recalls on the controller.

If it isn't possible for the tech on-site to notify Rhythm, or if Rhythm is not available and it is a time-critical situation and it is necessary to place a vehicle phase into recall:

- Flip the Detector Mode switch on the processor into Detector Mode before placing recalls on the controller and notify Rhythm at your earliest convenience.

This ensures that during the interim period all vehicle phases are serviced appropriately at the intersection after initiating any recalls on the controller. In addition, it may be necessary to adjust controller settings while operating in Detector mode and settings such as minimum greens, gap times, etc., may need to be adjusted for the intersection to run effectively. Contact Rhythm Engineering for help on these procedures.

12.2. IO Board Light Status

The blinking lights on an IO board can have the several different meanings:

- In|Sync Processor without DB25 connectors: 3 blinks - communication is good, 1 blink communication is bad
- In|Sync Processor with DB25 connectors: constant blink - communication is good, off - no communication

- Interface Module IO Board: constant blink - no communication, solid - communication is good, off - not in serial communication mode

12.3. Disabling Adaptive Mode Remotely

It is also possible to put an In|Sync system in Detector mode remotely via the Multi Camera View button on the In|Sync WebUI.

> ***Note:*** *Use your provided user name and password when logging in.*

1. Click the Manual Controls button. The Manual Controls box displays.
2. Click the Disable Adaptive button.



Figure 12-1. Disable Adaptive mode via the web interface

> ***Note:*** *The intersection remains in Detector mode until Enable Adaptive is clicked or you close the Manual Controls box.*

Again, if this becomes necessary, please notify Rhythm at your earliest convenience so that we can work with you to resolve the situation.

12.4. Configuring a DIN Relay

DIN Relays are pre-configured before shipping. The only instance in which you would need to configure a DIN Relay is for troubleshooting. If there is an instance where you need to configure a DIN Relay, complete the following steps:

12.4.1. Configure Your PC to access the DIN relay

The first steps in configuring a DIN Relay is to set up your computer to access both the DIN Relay's default IP address and the IP address that you plan to assign to the DIN Relay at an intersection.

For The Default DIN Relay's IP Address

1. Configure your PC LAN connection to directly connect to the DIN Relay (see Chapter 5 for instructions on configuring your LAN connection).
2. Click the Properties button in the Connection Properties dialog box.
3. Add the DIN Relay's default static IP address assignment as IP address:

   192.168.0.10, Subnet Mask: 255.255.255.0 and Default gateway: blank.

> ***Note:*** *If the default Windows settings won't access the relay, you'll need to add a compatible IP address, like 192.168.0.235, to the IP address field within the Internet Protocol Properties dialog box.*

For The DIN Relay's New IP Address

1. Click the Advanced button. The Advanced TCP/IP Settings dialog box displays.
2. Click Add in the IP Addresses section. The TCP/IP Address dialog box displays.
3. Type the new IP address and subnet mask you want to use for the DIN Relay in the IP address and Subnet Mask fields.
4. Click Add.
5. Click OK to exit the Advanced TCP/IP settings dialog box.

6. Click OK to exit the Internet Protocol Version 4 (TCP/IPv4) Properties dialog box.
7. Click Close to exit the Local Area Connection Properties dialog box.

12.4.2. Access the DIN relay settings

1. Connect a 8 - 24V AC or DC power supply to the DIN Relay's + and - terminals.
2. Turn on the DIN Relay by connecting the other side of the power supply to an outlet.
3. Restore the DIN Relay to factory settings to ensure it is set to the default IP address. To do this, press the RESET button on the front of the relay using a pen for two seconds. The ACT and PWR lights flash. This indicates that the relay has been reset.
4. Plug your laptop into the device by connecting an Ethernet cable from the DIN Relay's LAN port to your laptop's LAN port.
5. Open a browser window and type 192.168.0.100 in the Address bar and press [ENTER].
6. Log into the DIN Relay. The default user name and password are:
    - User Name: admin
    - Password: 1234
7. Click the Setup link from the menu on the left side of the page.
8. Under the Unit Names section:
    a. Type the intersection's road names in the Controller name field (i.e., Main St. and 1st Ave.).
    b. Change the Outlet (#) name fields from:

        "Outlet 1" to "NB"

        "Outlet 2" to "SB"

        "Outlet 3" to "EB"

        "Outlet 4" to "WB"

> ***Note:*** *If your cameras are not connected this way, adjust the Outlet names to your configuration.*

c. Click Submit.

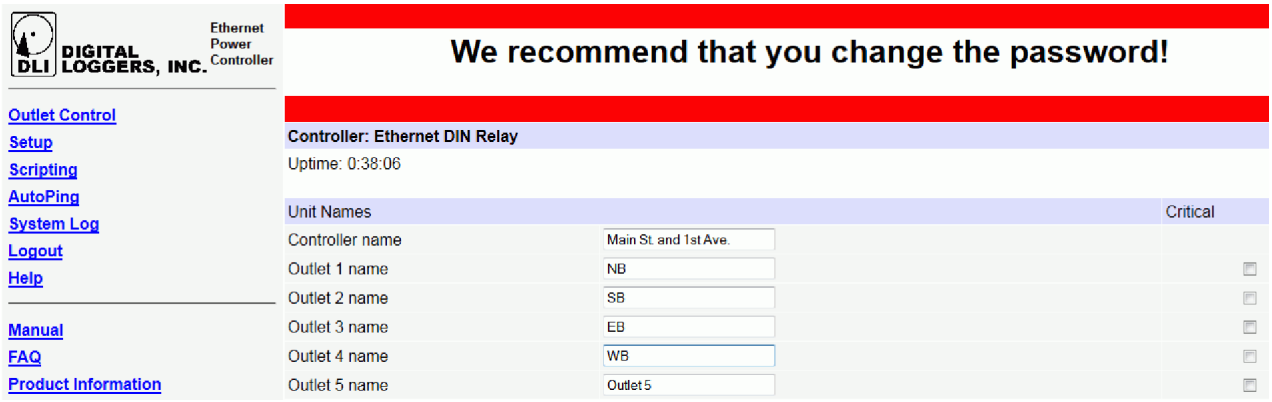


Figure 12-2. DIN Relay Setup screen

9. Scroll to the Network section:

   a. Change the default IP address to the intersection's new IP address (where the DIN Relay switch is installed) in the appropriate fields.

   b. Deselect the check box labeled Same subnet access only.

   c. Click Submit.

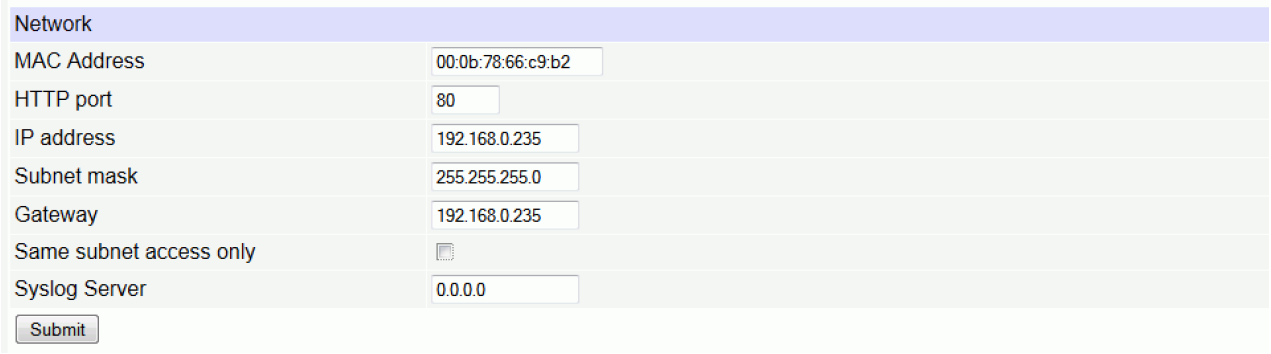


Figure 12-3. Network Settings

10. You are redirected to log in again to the DIN Relay, using the new IP assignment you assigned in step 9a and using the same login information from step 5.

11. Select Setup menu.

12. Scroll down to Administrator Credentials. Under Administrator Credentials:

a. Change the administrator login to rhythm in the Administrator Login field.

b. Type the old administrator password of 1234 in the Old administrator password field.

c. Type the new administrator password of travis123 in the New administrator password field.

d. Re-type the new administrator password of travis123 in the Confirm new administrator password field.

e. Click Submit.

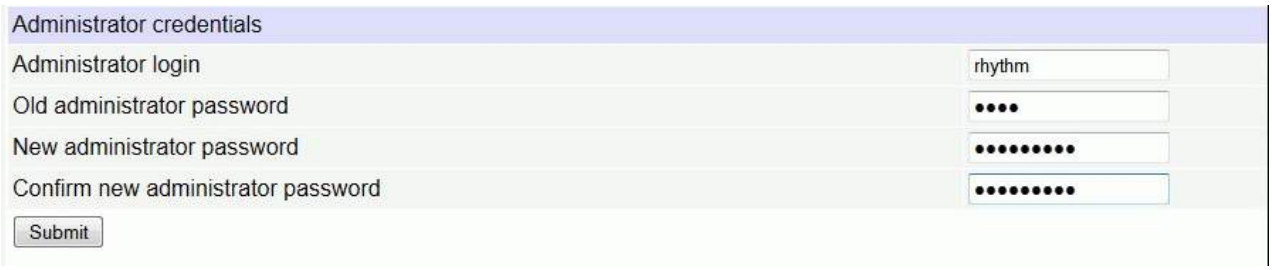


Figure 12-4. DIN Relay Administrator Credentials

13. Click Outlet Control from the menu.

14. Click Switch On from the Action column to activate each individual control for NB, SB, EB and WB.

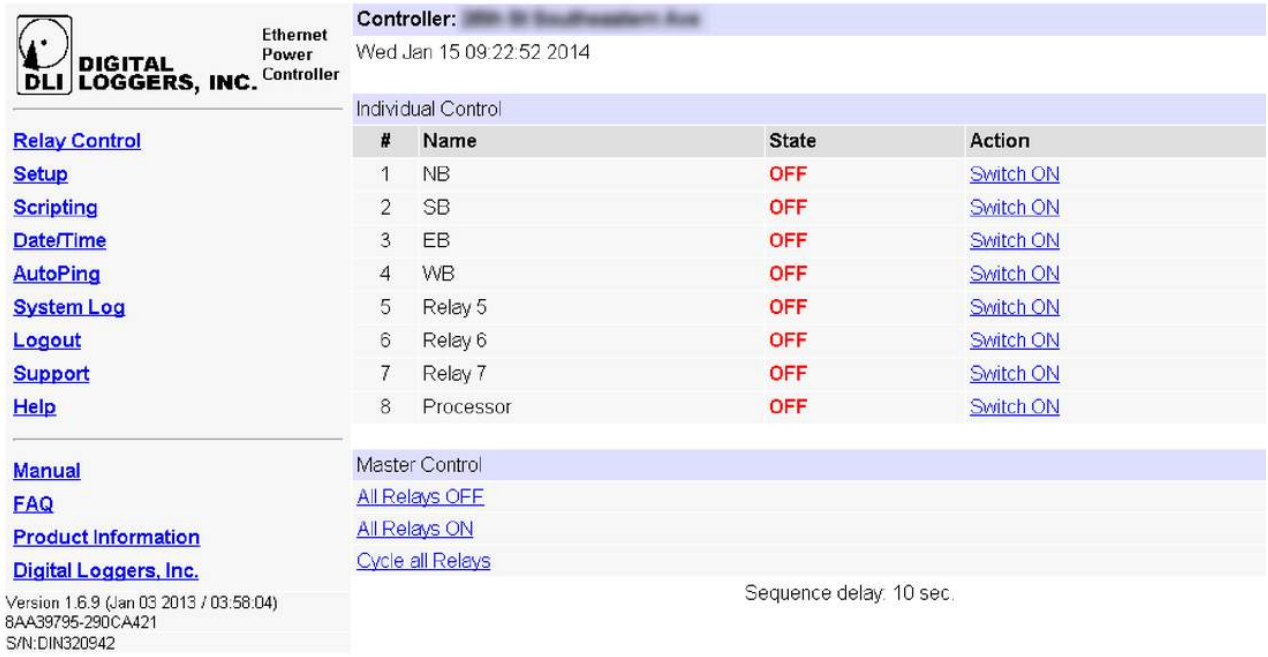


Figure 12-5. Outlet Control screen

15. Click Logout to log out of the DIN Relay configuration screens.

> ***Note:*** *When you are ready to use the device, please note that the functionality of Switch On and Switch Off will be reversed (the device will lose power in step 13, so when it comes back online, Off will mean On and On will mean Off).*

12.5. Installing In|Sync Using the Controller's Free Mode Signal

12.5.1. Background

All cabinets and controllers have some capability to explicitly define "free mode" operation to the controller via an external signal. The controller/cabinet may or may not already be configured to respond to such an external signal, but once set up, the controller will produce a 24 VDC signal on this pin and when the pin is grounded to logic ground, the controller moves into "free mode" operation.

In "free mode" the controller ignores all time-of-day plans and runs using the "base level"

configuration. When the controller's "free mode" pin is not grounded, the controller will run using the prior coordinated time-of-day plans.

The following instructions explain how to set your controller to operate in "free mode."

12.5.2. Install and configure

Setting up an existing traffic cabinet and controller to operate in "free mode" requires defining which pin the controller expects the signal to appear on and wiring the cabinet to provide a terminal for In|Sync to connect to and send the logic ground signal.

The controller must be configured to run the base level configuration or some other pre-defined plan when in "free mode." Set up this configuration according to In|Sync's "free mode" operation requirements.

> ***Note:*** *During an In|Sync failure, the "free mode" pin is "unset" by In|Sync and it will be up to the controller to coordinate traffic and serve the vehicle and pedestrian phases.*

V2 IO Board Installation

1. The V2 IO Board cable harness logic ground outputs are labeled Ped 1 Out thru Ped 4 Out. Wire all Ped outputs first using either Rhythm Engineering's Intercept Module or a spade cable. The general convention is to use:
    - Ped 1 In/Out for Ped Phases 2,5
    - Ped 2 In/Out for Ped Phases 4,7
    - Ped 3 In/Out for Ped Phases 6,1
    - Ped 4 In/Out for ped Phases 8,3
2. After all Ped phases have been wired, use any remaining outputs for the "free mode" operation.
3. The V2 IO Board has four available logic ground outputs. Tie one of these outputs to the "free mode" terminal in the cabinet.

> ***Note:*** If the intersection must service four pedestrian phases and has no available outputs, use Rhythm Engineering's Intercept Module or a spade cable to wire the pedestrian outputs. This frees up an output for "free mode" operation.

4. Connect one of the unused Ped outputs to the "free mode" terminal in the cabinet.
5. Using In|Sync's IO Board Mapper utility, set the Ped Out used above for the "free mode" operation to "is Adaptive." This instructs the system to produce a logic ground signal on that pin whenever In|Sync is in Adaptive mode and to not produce a logic ground signal otherwise.

12.6. The In|Sync Kiosk

The In|Sync Kiosk contains utilities for updating processor software, archiving and restoring configurations, changing IP addresses and accessing the specific Rhythm-specific utilities. To access the In|Sync Kiosk, connect the monitor and keyboard into the processor.

12.6.1. Update the processor software

For optimal In|Sync Processor performance and to make sure your processor contains the latest features, you can install the latest version of the processor software as it becomes available.

1. Prepare for any update by backing up your configuration.
2. Insert the USB flash disk containing the new software into a USB drive on the In|Sync Processor.
3. Click Update on the Advanced screen.
4. Click OK to indicate that you have inserted the USB flash disk. The Drive Browser dialog box displays.
5. Select the installation file from the USB drive. The processor installs the update.
6. Click OK to confirm that the install is currently running.

> ***Note:*** *Anytime a software update/installation is performed on the system (locally or remotely), a copy of that Install/Update is saved to the system. Then, anytime you backup a configuration, a copy of that update/install is placed on the USB flash disk. You can then use that version to update older systems in the field or spares in the office.*

12.6.2. Revert an update

The Revert Update option allows you to restore the In|Sync Processor back to its previous software version. This is useful for troubleshooting purposes. To perform a revert:

1. Select Revert Update from the Advanced screen. The Software Revert dialog box displays.
2. Type Perform Revert in the dialog box and click OK.

12.6.3. Backup a configuration file

It is good practice to back up In|Sync configuration files each time you make a change to a configuration. This ensures that you have a good backup copy of a configuration.

> ***Note:*** *In order to back up a configuration file, insert a USB flash drive into the In|Sync Processor.*

To back up a In|Sync configuration file:

1. Click Backup from the Home screen. The Insert USB Drive dialog box displays.
2. Make sure that a USB flash drive is inserted into the In|Sync Processor and click OK. A Backup completed successfully! message displays after a minute.
3. Click OK to close the Backup completed successfully message.

> ***Note:*** *Archived files are automatically saved in a In|Sync\Conf\ArchiveIn|Sync folder.*

The files names indicate the date and time that the file was archived. Each file is prefixed with the intersection name, followed by the year the file was archived (in four digits), the month (two digits) and the date (two digits). It is then followed by an underscore character (_) and the time of day the file was saved (hour, minute and seconds (in military time format)).

12.6.4. Restore a configuration file

This process is useful for configuring a spare processor as a replacement. It also can be used to replace an In|Sync configuration file that seems to be corrupt on a working processor.

> ***Note:*** *In order to restore a configuration file, you must have an archived In|Sync configuration file stored on a USB flash drive, which must be inserted into the In|Sync Processor before selecting the Restore button.*

To restore an In|Sync configuration file:

1. Click Restore from the Home menu. The Insert USB Drive dialog box displays.
2. Make sure the USB flash drive containing the configuration file is inserted into a open USB port on the In|Sync Processor. Click OK. The Drive Browser dialog box displays.
3. Select the archived configuration that you want to restore from the Files list.

> ***Note:*** *Archived files are automatically saved in a In|Sync\Conf\ArchiveIn|Sync folder, which is the folder that automatically opens when you select Restore.*

The filesnames indicate the date and time that the file was archived. Each file is prefixed with the intersection name followed by the year the file was archived (in four digits), the month (two digits) and the date (two digits). It is then followed by an underscore character (_) and the time of day the file was saved (hour, minute and seconds (in military time format)).

4. Click OK. The Verify Selection dialog box displays, asking if the selection was correct.
5. Click Yes to continue to restore the configuration file. The Processor Type dialog box displays.
6. If the In|Sync Processor is running the In|Sync software, click Main. If the In|Sync Processor is a video only processor, click Video. The system then restores the configuration.
7. Click OK after seeing the Restore Completed Successfully dialog box.

12.7. Support Drive Instructions

12.7.1. What you need:

- This document
- A VGA monitor (if one is not installed in the cabinet)
- A keyboard
- A support drive USB jump drive

12.7.2. Identify your In|Sync Processor

The In|Sync Processor's front panel comes in two different styles:

- "Style L contains no LED status lights.
- "Style A contains two LED status lights.

Use Figure 6 to identify your system as either Style L or A.

FIGURE 14 - 6. *Processor Style L and A Differences*



Figure 12-6. Processor Style L and A Differences

12.7.3. Restore a processor

⚠ **WARNING:** Following these instructions will format the processor's hard drive and restore it with a fresh operating system.

To delete all data from the processor and restore it with a new operating system:

1. Cycle power off to the In|Sync Processor.
2. Insert the jump drive into an available USB port on the processer.
3. Turn on the In|Sync Processor.
4. If you have a Style L processor (see Figure 14 - 6), press the [ESC] key until the Boot Device menu displays.If you have a Style A processor (see Figure 14 - 6), press the [F11] key until the Boot Device menu displays.
5. From the Boot Device menu, use the arrow keys to select USB - XXXX and press [ENTER]. The In|Sync Factory Reset Drive menu displays.
6. The default selection on the menu is Restore system image to In|Sync Processor. Press [ENTER].

> ***Note:*** *If no key is pressed in 5 seconds the menu times out and goes directly to the next step and starts the restore process. Go to step 7.*

7. When complete (approx. 60 to 90 sec), you see a message that Live Restore is complete. Type 1 and press [ENTER] to reboot the processor.
8. Remove the jump drive and press ENTER to complete the reboot.
9. At this point the network settings need to be set. Contact Rhythm Support for help.
10. Once the system is connected to the network, Rhythm Support can assist with restoring the configuration or it can be restored using a backup taken before the wipe process.

We trust that the information here is helpful. If you have any questions or require further support please don't hesitate to reach out to us at:

info@rhythmtraffic.com

913.227.0603

rhythmtraffic.com/contact



ATTACHMENT B

eagle|EYE Installation Guide

v1.0, September 2023. Chapters 1 through 8 only.

Site B is a stand-alone queue detection site with no signal controller connection. Chapters 9 through 11 of this guide (controller connections and related checklist) do not apply and are omitted.

Where this guide conflicts with the contractor instructions, the contractor instructions govern.

RHYTHM ENGINEERING

eagle|EYE



eagle|EYE DATA COLLECTION UPGRADE TO AI & TIMING PLAN GENERATION SYSTEM

INSTALLATION GUIDE

v1.0/ September 2023

EAGLE|EYE
DATA COLLECTION UPGRADE TO AI & TIMING PLAN GENERATION SYSTEM
INSTALLATION GUIDE

The installation and maintenance guide provides an overview of the eagle|EYE camera and hardware components, plus instructions on their assembling into a fully functional data collection and counting system. It is designated as an aid for traffic engineers, signal technicians and contractors. The document covers the mounting and installation requirements for deploying the eagle|EYE camera at the intersection, as well as field-ofview adjustments so that the next steps in the process can be further completed with the expected accuracy. Additionally, the guide explains the components for interfacing with the traffic signal controller and the steps to install and connect them.

Note: *It is important that the parties responsible for the installation and maintenance of the eagle|EYE system carefully read through the details of this manual prior to installing, using, or attempting to do maintenance of the system.*

Version 1.0/September, 2023

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Rhythm Engineering
14019 W 95th St.
Lenexa, KS 66215
913-227-0603
info@rhythmtraffic.com

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Chapter 1. Introduction

eagle|EYE is a data collection and timing plan generation technology, that uses Artificial Intelligence, based on Neural Networks for object recognition. It delivers data charts and reports and can be integrated with larger traffic management systems.

The hardware framework of the eagle|EYE solution consists of a 130-degree, large field-of-view Axis camera, mounting hardware, an AI processing unit and controller interfacing components. The eagle|EYE system is designed with an eye for flexibility – the data collection and counting area may utilize one camera to cover two approaches, or for complex geometries or very large intersections - one camera for each leg. One processor with NVIDIA Jetson board can collect and analyze data from two cameras!

The eagle|EYE system differentiates between vehicles, pedestrian, and bicycles and collects data 24/7/365. The counting functionality works through tracking of each object from the moment they enter the monitored area on the sidewalk, to the moment they exist the counting zone. To guarantee precise counts, the camera needs to be installed with an optimal view over the designated approaches. The CNN algorithm recognizes objects with unprecedented accuracy, increments a counter, and then generates credible visual charts. This ensures that vulnerable road users can be factored in your traffic management plans based on credible data.

Chapter 2. Pre-requisites

2.1. Equipment Included

The camera will be shipped in an assembled state.
The following accessories are included with the shipment:

a) Rubber cable grommet piercer for RJ45
b) Extra rubber cable sealing grommet
c) T10 torx key



Figure 1. Accessories a), b) and c)

2.2. Tools Needed

a) Banding straps (3/4" or 1/2" and fastening buckles) or two pipe clamps, large enough to fit around the pole to which the camera will be mounted.
b) T20 and T10 torx screwdriver (Only T10 torx key is included with the camera)
c) Network cable tester (Fluke CIQ-100 or equivalent)

2.3. Connectors

- Network connector - RJ45 Ethernet connector with Power over Ethernet (PoE).
- Power connector/Audio connector (unused)

Chapter 3. Camera Mounting

3.1. Camera Mounting Location

1. Mount the camera at 25-30 ft. from the ground.
2. Make sure that the camera can see a little of each approach, all paths of vehicle travel through the intersection, and complete view of the apex of the intersection.
   - Typical installations are in the corner of the intersection on the traffic signal pole upright, above the mast arm.
   - The camera should be mounted as close to the signal cabinet as possible, to avoid installing Ethernet repeaters.

Chapter 4. Network Cable Requirements

4.1. Cable Type

A minimum of Cat6, shielded, outdoor and burial rated, 23 AWG Ethernet cable should be used. The network cable will be terminated with shielded RJ45 connectors on each end, using T-568B RJ45 pinout.

4.2. Testing the Cable Connectivity

Prior to connecting any equipment, the network cable will need to be tested with a cable tester (Fluke CIQ-100 or equivalent) to ensure there are no shorts or open connections in the cable. Any test failure will require one or both RJ45 terminals to be re-installed, until the test passes. The test should be conducted multiple times while twisting the end of the cable, to ensure the RJ45 crimp is not loose. If the cable will not pass testing, the cable may be damaged, and a new cable will need to be pulled.

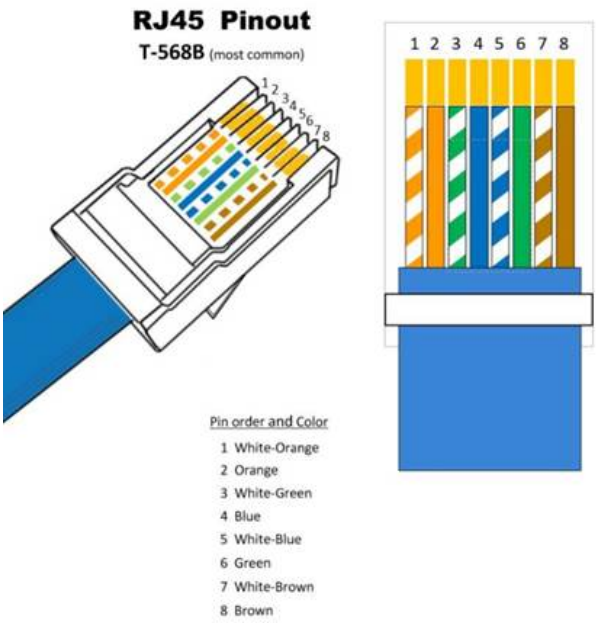


Figure 2. Network cable terminations

If the network cable exceeds 100m (328ft.), an Ethernet repeater will need to be installed. Repeaters should be installed above ground where possible; the base of the signal pole is a good choice. Repeaters installed below ground should be placed in an IP67 rated enclosure.

4.3. Ethernet Repeater Installation

In instances where the distance between the camera and the cabinet is more than 300ft. (~100m), Rhythm Engineering recommends installing an Ethernet extender a.k.a. repeater, and a PoE injector. The Ethernet repeater boosts the Ethernet signal strength. The PoE injector is installed in the traffic cabinet.

While the market offers different makes and models of extenders, we recommend Veracity Outreach Max XT. The instructions below pertain to the recommended model.

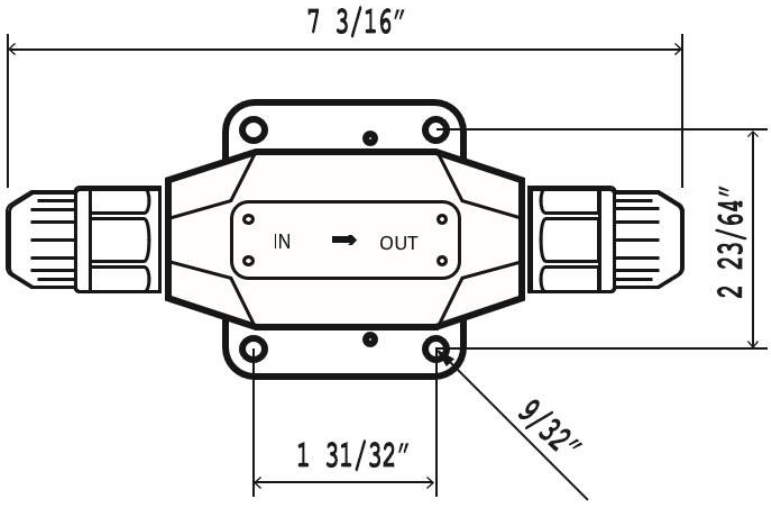


Figure 3. Ethernet extender dimensions

4.3.1. Dimensions and Mounting Holes

- The mounting plate is 2 33/64” x 2 29/32” x 5/64” (64mm x 74mm x 2mm). The enclosure is 3 15/16” x 1 31/32” x 1 3/16” (100mm x 50mm x 30mm).
- Warning exposure to strong direct sunlight may heat the product beyond its operating specification, shade where possible.
- Do not mount the product within a second outdoor enclosure. Thermal insulation combined with solar heating may result in high internal temperatures.

4.3.2. Gasket Sizes

Check the cable gasket fit. For wider cables, the gasket can be removed and replaced. Two alternative-size gaskets are included.



Figure 4. Cable gasket



Figure 5. Matching cable size to gasket

Cable Gasket	Cable Diameter	Example Cable
Black (fitted)	3/16" - 1/4" (4.7 - 6.5mm)	Cat 5e UTP, Cat 6 UTP
Green	15/64" - 5/16" (6.0 - 7.8mm)	Cat 5e, Cat 6 STP, Cat 6a
Red	9/32" - 23/64" (7.0 - 9.0mm)	Double Shielded, older Cat 6a

4.3.3. Fitting the Mounting Plate

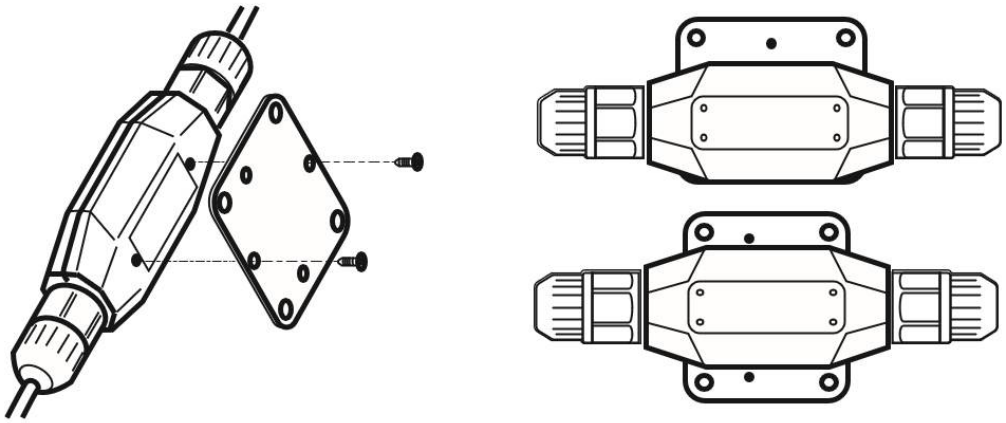


Figure 6. (left) Extender with mounting accessories / (right) Plate mounting variations

Attach the product to the mounting plate using the two screws supplied, (Fig. 6).

1. The plate can be attached in two different orientations to suit the installation (Fig. 6 right).

2. Mount the product horizontally where possible.

Note: *Ensure nothing can push on the connectors and that the cables are supported and not in tension.*

4.3.4. Fitting Connectors

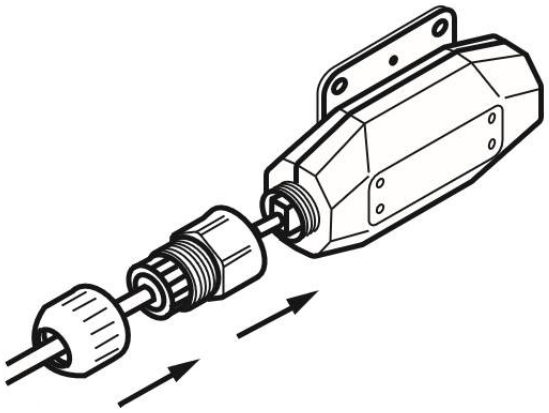


Figure 7. Physical connection components

1. Fit the cable cover parts over the cable, loosely assembled or separately in the order shown:

- Fit a standard (shielded or unshielded) RJ45 plug to the cable and connect it to the product
- OUTREACH Max XT should be connected to PoE-compatible equipment only. Connect the RJ45 plug to the product:
- Check the RJ45 plug clicks into place securely;
- Fit the cable casket into the connector nut if it is not already in place;
- Check the cable gasket is fully inserted;
- Check the red O-ring is present.

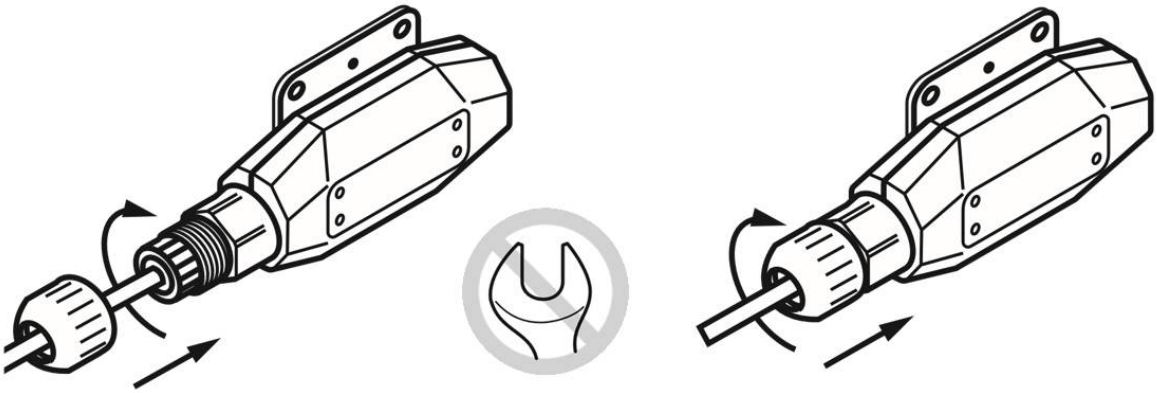


Figure 8. (left) RJ45 connector attached to extender / (right) Cable nut fastened to connector

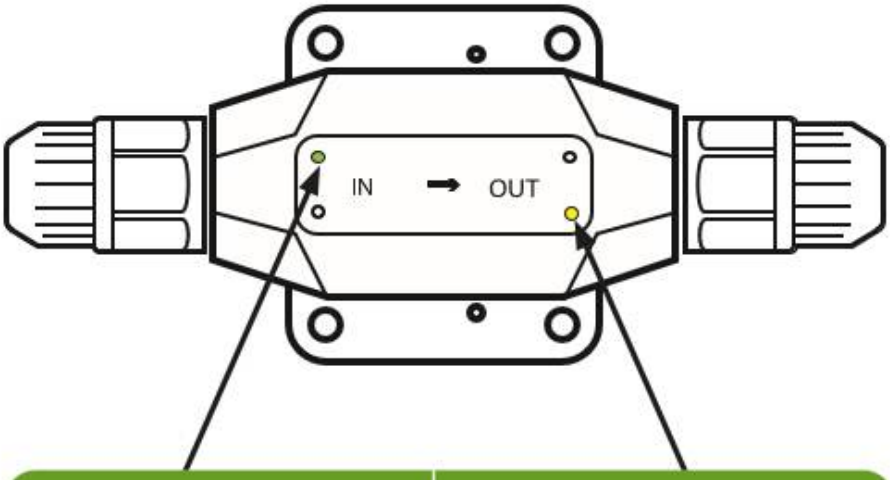
2. Tighten the connector nut firmly by hand. The connector nut should nearly contact the enclosure when fully tightened.

3. Tighten the cable nut firmly by hand. The cable nut should contact the connector when tightened.

The cable gasket should compress firmly around the cable without bulging or rippling.

4.3.5. LED Indicators

OUTREACH MAX XT is transparent to PoE and will power up when both the PoE and powered device are ports connected.



POWER (Green)	LINK/Activity (Yellow)
ON Power good	ON Link
OFF No PoE	FLASH Activity

Figure 9. LED lights schematic

4.3.6. Ethernet and PoE Extension

To extend Ethernet with PoE, use OUTREACH Max XT to connect cable sections of up to 328ft. (100m):

- OUTREACH devices use standard Cat5e/6A type Ethernet cable and RJ45 connectors, and auto-detect rate and crossover;
- OUTREACH Max XT should be connected to PoE-compatible equipment only.

4.3.7. Increasing Range and Power

Two or more OUTREACH Max XT devices may be used to create full-bandwidth connections over 656ft. (200m) repeater, by joining multiple cable sections of up to 328ft. (100m) each.

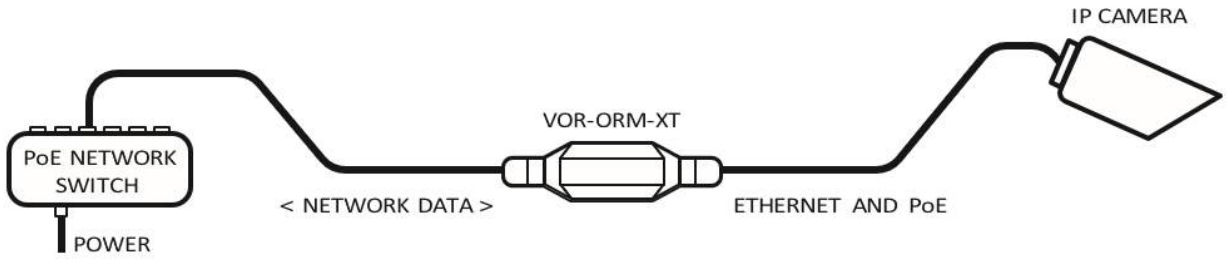


Figure 10. Connection schematic with one extender

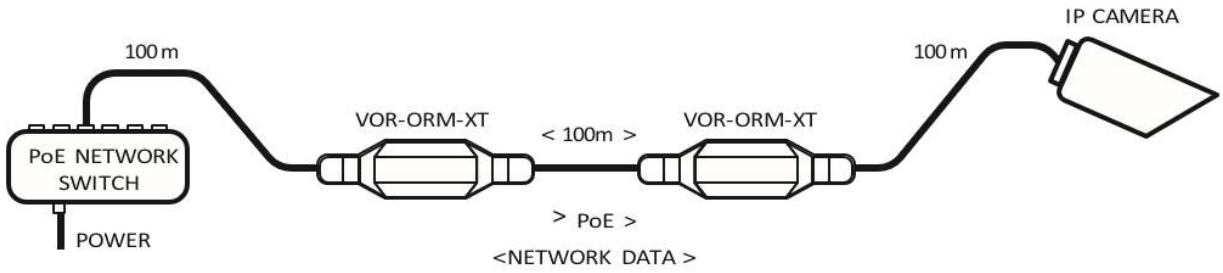


Figure 11. Connecting to power schematic with two extenders (100m = 328ft.)

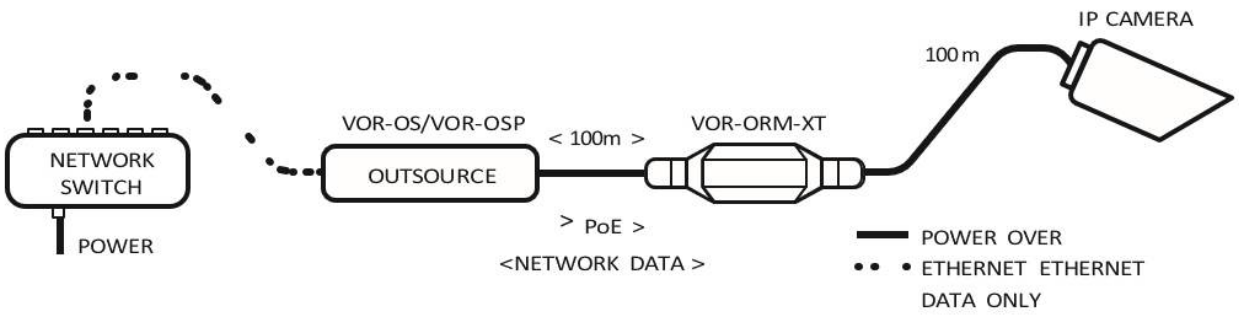


Figure 12. Maximizing connection through combination of extenders

4.3.8. Maximum Range

Maximum range for camera power up to (Watts) is given in the table below:

PoE Source	No PoE	5W	10W	15W	20W	25W
1 EEE 802.af switch	1,640ft. (500m)	984ft. (300m)	656ft. (200m)	N/A	N/A	N/A
OUTSORCE	1,640ft. (500m)	1,312ft. (400m)	984ft. (300m)	N/A	N/A	N/A
1 EEE 802.af switch	1,640ft. (500m)	984ft. (300m)	984ft. (300m)	656ft. (200m)	656ft. (200m)	N/A
OUTSORCE	1,640ft. (500m)	1,312ft. (400m)	1,312ft. (400m)	984ft. (300m)	984ft. (300m)	656ft. (200m)

Note: *The connectors on the Outreach Lite and Outreach Max are rated IP66, which is an Ingress Protection rating. IP66 rating means it can withstand water sprayed with high pressure at the connectors. It does not mean that the repeater is protected if it is immersed in water. If deployed below street level, please place the repeater in a waterproof box or enclosure.*

Chapter 5. Camera Installation

5.1. Step-by-step Instructions

Perform the following steps to install the camera.

1. Attach the Base Bracket to the Pole

2. Separate the camera from the base with pole bracket by loosening the two screws on each side of the housing using a T10 torx screwdriver or the provided T10 torx key.



Figure 13. Pole bracket tightening screws

3. Separate the junction back box from the pole bracket and adapter plate by loosening the four screws (2) and unhook the camera from the safety hook (1).

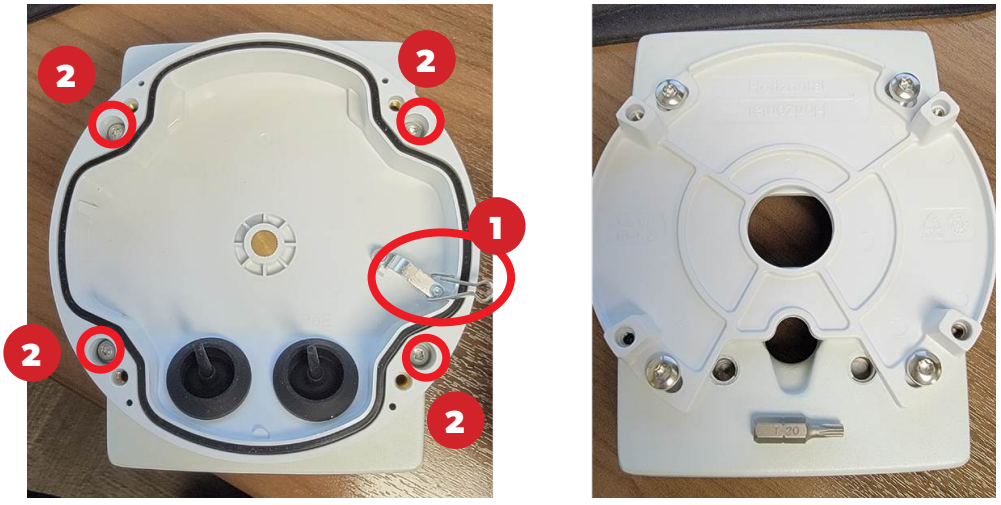


Figure 14. (left) Junction Box attached to adapter plate / (right) Adapter plate attached to pole bracket

4. Attach the base pole bracket with attached adapter plate to the pole using banding straps.

a) Align the base to face the center of the intersection.

b) Make sure the lower cable entry faces down; if mounting to a horizontal pole, the cable entry will face to the left or right.

5. Pull the Network Cable to the Camera.

a) Pull the network cable to the base of the bracket.

b) Attach a shielded RJ45 connector. In the signal cabinet, install a shielded RJ45 connector on the end of the same network cable.

Note: *Use a network cable tester (Fluke CIQ-100 or equivalent) and make sure the network cable passes testing: there are no shorts or open connections on the RJ45 connectors etc.*

6. On the right side, remove the tip of the black rubber cable seal grommet by pulling on it.



Figure 15. Removing the grommet*

7. Install the red piercing tip onto the end of the RJ45 connector.

8. Insert the cable through the lower cable entry of the pole bracket and adapter plate and then through the black rubber cable seal grommet to the right on the junction box.



Figure 16. Network cable pulled through grommet

9. Remove the red piercing tip.

10. Align the junction box over the adapter plate and tighten the screws with the T10 torx key or screwdriver. Attach the camera safety hook to the junction box.



Figure 17. Junction box fixed over the adapter plate

11. Insert the network cable into the Ethernet port on the back of the camera.



Figure 18. Network cable plugged into the Ethernet port

12. Attach the camera to the junction box using the four screws. It needs to fit into the provided edges.



Figure 19. Camera base and collar need to click*



Figure 20. Camera mounting completed *

Note: *Images marked by an asterisk* have been taken from the manufacturer's website and as such are a copyright to the same manufacturing company: https://www.axis.com/products/axis-p1448-le*

5.2. Power the Camera and Verify Communications

Next, we need to provide power through to the camera and to get it onto the network.

1. Connect the network cable from the camera to a PoE source.
   - If using a single port PoE injector, connect the camera to the DATA+PoE OUT port and connect the DATA IN (non-PoE) port to a network switch.

• If the camera needs to have the network IP address changed, connect directly to the network switch or "DATA IN" port of the injector and follow the instructions in the manual for setting the eagle|EYE camera IP address.

2. Using an Ethernet patch cable, connect a laptop network port directly to the "DATA IN" port of the PoE injector or to the network switch. The IP address of the laptop network port needs to reside in the same subnet as the camera, for both devices to communicate.

3. Once the laptop is setup correctly, open a web browser and enter the IP address of the camera. If the camera was installed correctly, the camera login screen will be presented, and the video stream will be shown.

Chapter 6. Adjusting the Camera View

6.1. Camera View Adjustment

1. Loosen the collar screw with the T10 torx key or screwdriver so that the collar can be rotated.



Figure 21. Position of screw on collar

2. Adjust the camera head so that the view is level.

3. Tilt the camera head downward to eliminate as much horizon as possible, while still being able to see 2-3 cars in all lanes of both approaches at the top of the view.

4. Move the camera head left/right so that there is a view of at least 1-2 cars in each lane of each approach at the side of the image. An example of an optimal alignment is shown below on Fig. 22 and 23.

5. After the camera head is set for the best view, tighten the screw again.



Figure 22. Optimal camera view of stop bar



Figure 23. Optimal camera view of apex

Chapter 7. Sunshield Adjustment

1. Adjust the sunshield of the camera by pressing on the tab at the back of the shield. The sunshield should be extended as far as possible without interfering with the image.



Figure 24. Tab for loosening the shield

2. Move the sunshield forward or backward as needed until it reaches the desired position. The shield should lock into place.



Figure 25. Sunshield in final position

Chapter 8. Eagle|EYE Processor and Equipment Installation

8.1. Installing eagle|EYE Processor and Power Supply

Refer to Fig. 26 Connecting eagle|EYE Equipment to Traffic Cabinet for additional information.
All components of the eagle|EYE system can be mounted on DIN rails. The image below shows the final installation.

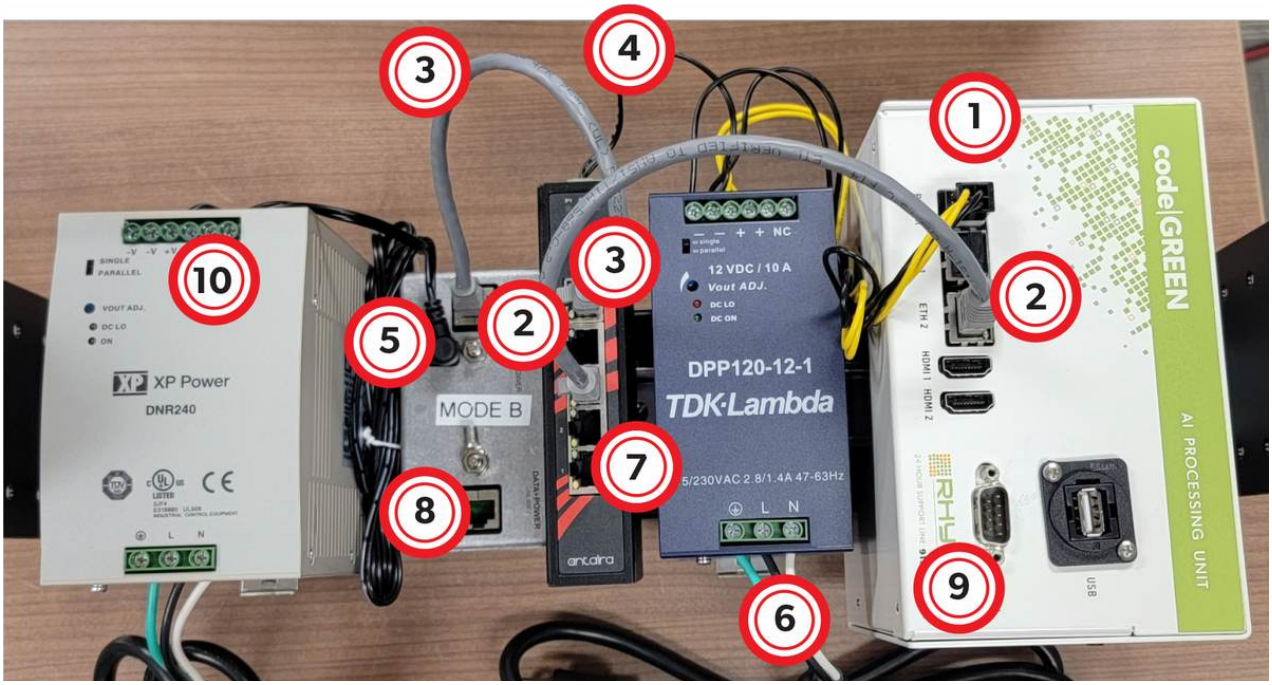


Figure 26. eagle|EYE processor and equipment connections

Assemble the equipment on a DIN rail as shown in the image above. Then, make the following connections:

1. eagle|EYE processor power (12 VDC).
2. Network patch cable from ETH 2 to network switch port.
3. Network patch cable from DATA IN of 48 VDC Passive PoE injector to network switch port.
4. Power connection to network switch (12 VDC).

5. 120 VAC power to 48 VDC Passive PoE injector.

6. 120 VAC power to 12 VDC power supply.

7. Network WAN/fiber switch port for network patch cable to traffic cabinet.

8. Network cable from field camera connects to DATA+VDC OUTPUT port of 48 VDC Passive PoE injector.

9. Processor serial port to Rhythm I/O modules (Fusion, SDLC, Ped).

10. 48 VDC, 240 WATT PSU – XP POWER DNR power supply unit for the eagle|EYE camera.

The eagle|EYE processor has a spring loaded DIN rail clip on the bottom side of the bracket and can be removed from the DIN rail by lifting up on the bottom of the processor enclosure and tilting the processor forward at the top and away from the rail.



Figure 27. DIN rail bracket

The 120 Watt, 12 VDC power supply has a spring loaded DIN rail clip on the bottom and can be removed from the DIN rail by pulling on the DIN rail bracket spring clip from the bottom side of the power supply and pulling the bottom out from the rail, and lifting the unit off the rail from the top.



Figure 28. Fower Supply Unit (left) / DIN rail bracket and tab to pull on (right)

The network switch has a spring loaded DIN rail on the top side of the clip and can be removed by pressing down on the unit from the top and pulling the unit away from the rail on the bottom, then lifting the unit off the rail.



Figure 29. DIN rail bracket attached to network switch

The 48 VDC Passive PoE injector has mounting feet for flexible installation, including fixing to a DIN rail.



Figure 30. PoE injector

We trust that the information here is helpful. If you have any further questions or require further support please don't hesitate to reach out to us at:

info@rhythmtraffic.com

913.227.0603

rhythmtraffic.com/contact

