City of Seward, NE

Tuesday, January 5, 2016

Regular Session

Item G11

CONSIDERATION OF INSTALLING AN EMERGENCY VEHICLE PRE-EMPTION SYSTEM - John Hughes

Administrative Report: The pre-emption system allows for emergency vehicles to control the three stoplights within the City. It is the recommendation of Olsson Associates and NDOR not to pursue an immediate EVP project due to cost and NDOR plans of reconstructing US-34 and changes along Hwy 15.

Following review and discussion, Council to provide direction.

Staff Contact:

MEMO

Date: November 23, 2015

To: John Hughes, City of Seward

From: Shane King, PE, PTOE

Re: Seward Emergency Vehicle Pre-emption
OA Project No. 015-2742

Cc: Pat Sterns, NDOR
Kent Wohlers, NDOR

INTRODUCTION

This memorandum addresses and documents progress to date regarding the proposed EVP project in downtown Seward. At this time, the Engineer is not proceeding with design work due to the findings of the field review. Based on that review, it is the Engineer's recommendation that the City of Seward not proceed with construction / implementation of this system.

The project general scope is as follows:

Olsson Associates will perform field verification, engineering design, and plan preparation for implementation of an Emergency Vehicle Pre-emption (EVP) system for three signalized intersections in Seward, NE. This system will be capable of controlling traffic signals and providing green to approaching emergency vehicles equipped to communicate with the system. Design work will follow NDOR Standard Plans and Specifications.

SITE RECONNAISSANCE AND FIELD REVIEW

OA (Shane King) conducted a field review with NDOR representation (Pat Sterns) on October 15, 2015. Prior to the visit, NDOR provided record drawings (July 2012) of the three signalized intersections. The plans identify pole, pull box, and cabinet locations as well as conduit size, paths, and contents. The following paragraphs outline conditions and findings at each intersection.

US-34 & 5th Street

This signal was constructed new in 2012 from the ground up including poles, mast arms, heads, and a new pole mounted cabinet in the SW corner. However, none of the underground components were replaced. One of the resulting obstacles is a lack of space in old, small conduit and a lack of access points (pull boxes) to the conduit system. Pictures 1 and 2 illustrate the single entry point into the pole mounted cabinet (Picture 3).

Conduits running to the cabinet from both directions are full and do not have the capacity to accommodate a cable for the EVP system. The solution in the SW corner would be to place a new pull box and run conduit to each of the other corners. However, this would have a trickle effect if a conduit were run to the SE corner for example; there is no path to then enter the pole foundation and up to the EVP receiver. Above ground pole entries would be necessary using RGS conduit which can be an obstruction and tripping hazard. It would be difficult to locate pull boxes in each of these corners given ROW constraints. This is likely the reason that pull boxes were not added when the signal work was performed in 2012.

The intersection does have the capability of communicating back to US-34 & N-15. However, it is over a 2-pair communication cable. This cable wouldn't have the ability to allow the EVP system to "talk" between intersections. While there is very little room in the cabinet, components could be rearranged to provide space for the EVP phase selector. Picture 4 shows the back side of the cabinet (double doored).

Picture 1

Picture 2

Picture 3

Picture 4

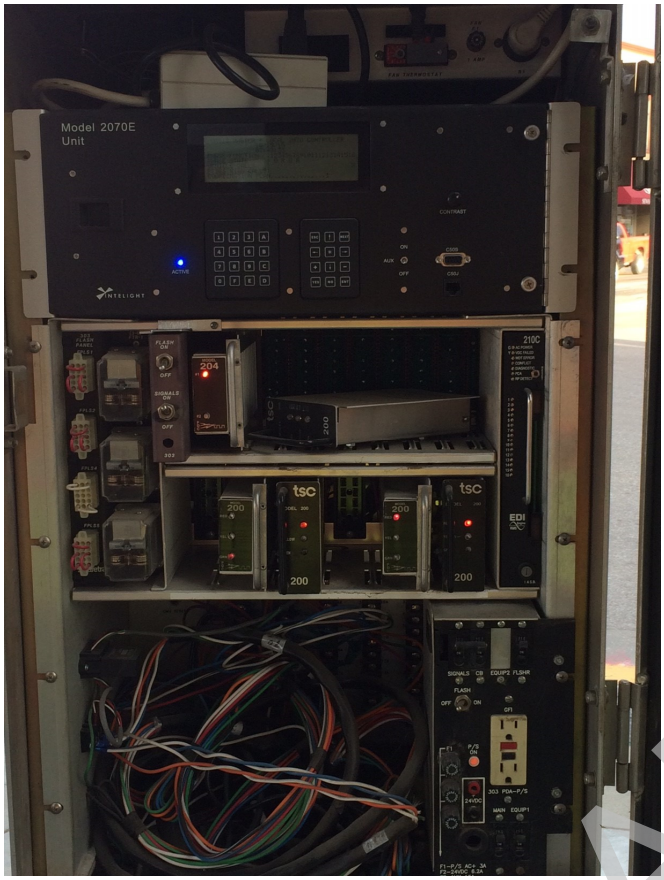
US-34 & N-15

This is the main intersection of the three and would be the “master” regarding communications between the East and North intersections. This intersection controller is also contained in a pole mounted cabinet with the only entry for signal cables coming through the pole. The auxiliary conduit shown in Picture 5 is for service cables which come from the alley to the East. This cabinet does not have sufficient room for additional EVP equipment and would need to be replaced with a pad mount version to make the accommodations. Picture 6 illustrates the cabinet contents.

The work done at this location in 2012 involved the previously referenced communications cable. Field observations after pulling the pull box lid and examining the cabinet indicate that it is not feasible to pull additional cables into the existing conduit. To implement an EVP system, new conduits and pull boxes would need to be added to the intersection. This would prove difficult due to ROW constraints.

Picture 5

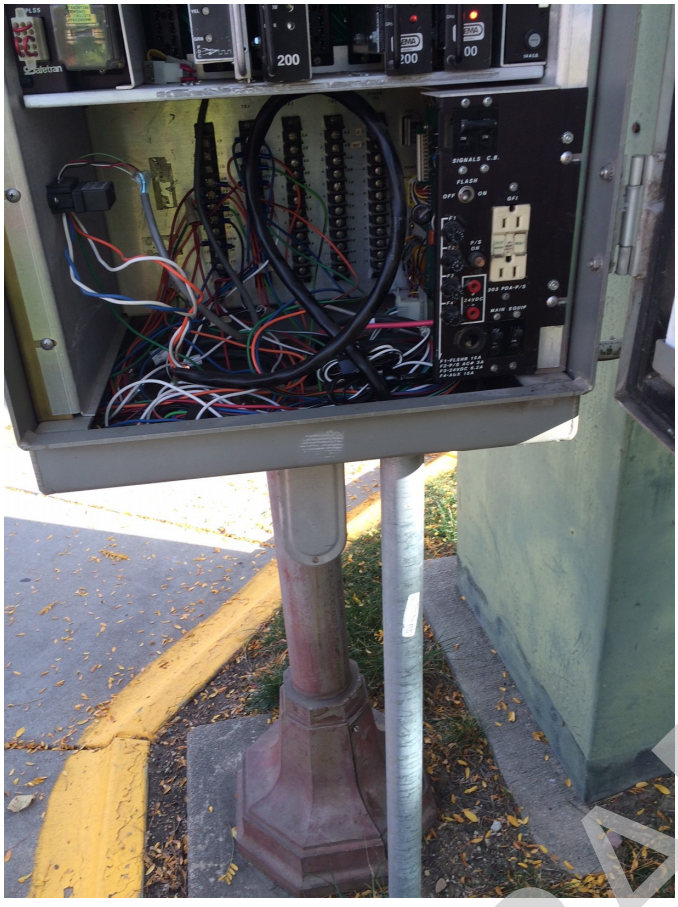
Picture 6



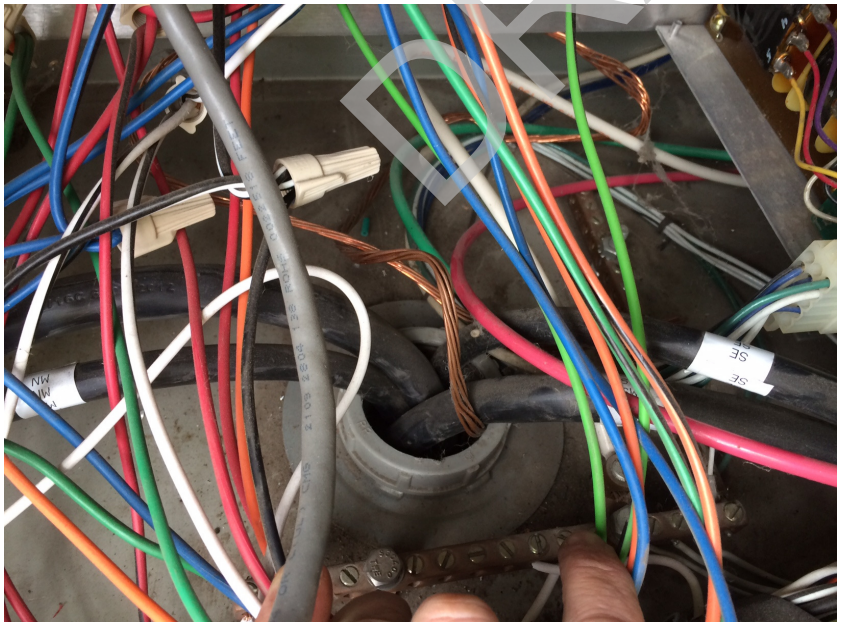
N-15 & Seward Avenue

This is an old signal system with two diagonal mast arm poles in the NE and SW corners. There are zero pull boxes in place. All conduit is routed directly pole to pole and the controller equipment is housed in a free standing pedestal type cabinet. Similar to the other intersections, conduit is full and without pull boxes, there is no means to access the conduit system. This would force any pole entries to be external in lieu of entering the pole base. Pictures 7 and 8 show the cabinet and the entry point for signal cables coming from the poles. The cabinet at this intersection does not have capacity for the EVP equipment; it would be NDOR's preference to upgrade to a new, pad mount cabinet should any modifications be made.

Picture 7



Picture 8



MATERIALS NEED
There are common needs at all three intersections to make this project feasible as intended when scoped and initiated by the City. Those generally include existing conduit paths and cabinet space. It was determined following the hands on field review that new conduits, pull boxes, and cabinets would be necessary to implement the EVP system.

ADDITIONAL COST
The preliminary estimated construction budget for this project was $12,000/intersection. The additional materials needed create a significant increase in project cost. The estimates below of additional cost are based on planning level design and measurements, not a detailed layout.

- Pull boxes - $4,000
- Cabinets - $4,200
- Conduit - $8,800
- Fiber - $1,000

FUTURE PROJECTS
A common method of making traffic signal system improvements that are not immediately urgent is to program them for incorporation into future projects. This approach is attractive for this proposed EVP project. As documented, many of the traffic signal components are outdated (especially N-15 & Seward Avenue). With the diagonal mast arm design at N-15 & Seward Avenue, it can be concluded that at some point, NDOR will elect to reconstruct the traffic signal (as was done at US-34 & 5th Street). Any future traffic signal projects along N-15 would likely address many (if not all) of the additional materials needed to make the intersection ready for EVP. Not only would that translate to a construction cost savings but will also allow the City to retain dollars designated for design under this current contract.

SUMMARY AND RECOMMENDATION
It is uncommon that a field review will redirect the entire direction of a scope of work. However, it is the Engineer's recommendation (supported by NDOR staff), not to pursue an immediate EVP project at the three intersections studied. The cost and impact to implement is deemed to exceed any realized benefit. While an EVP system would promote priority to emergency vehicles at intersections, it does not seem that these three intersections are impassible for extended time periods. This opinion is based on the Engineer's multiple visits to Seward regarding Traffic Engineering issues/concerns over the last two years.

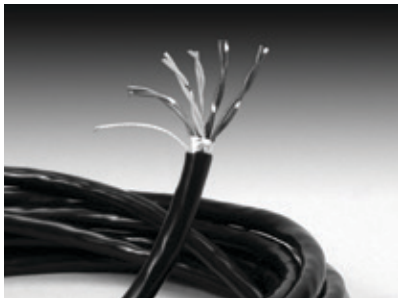
Unless directed specifically otherwise, OA will not initiate the design of an EVP system.

F:\Projects\015-2742\40-Design\Reports\TRFC\Doc\EVP Memorandum.doc

OPTICOM™ PRIORITY CONTROL SYSTEM

OPTICOM™ MODEL 1070 GPS INSTALLATION CABLE

OPTICOM™ SYSTEM COMPONENT FOR ENVIRONMENTS WITH GPS TECHNOLOGY



Description

The Opticom™ Model 1070 GPS Installation Cable is designed and manufactured explicitly for use with Opticom™ Radio/GPS units. The Opticom™ Model 1070 GPS Installation Cable has ten (5-pair) color-coded twisted conductors, a conductive shield and drain, and a black PVC jacket.

This durable, high-quality cable carries the appropriate power to the Opticom™ Radio/GPS unit from the Opticom™ Phase Selector and delivers the necessary quality signal to the phase selector up to 250 feet (76 m).

Global Traffic Technologies, LLC (GTT), formed in 2007 from 3M's pioneering Intelligent Transportation Systems business, is the manufacturer of Opticom™ priority control systems and Canoga™ traffic sensing systems.

Features and Benefits

- Optimized to interface Opticom™ Radio/GPS units to Opticom™ Phase Selectors
- Ensures effective range of at least 2,500 feet (760 m) with Opticom™ GPS System components
- Durable construction
  - Suitable for direct burial
  - Suitable for conduit and mast arm pull
  - Suitable for exposed overhead installation*

Operating Parameters

- 300 volt rating
- 90° C (194° F) temperature range
- Outer Jacket: Black SR-PVC, UV and moisture resistant
- Ten twisted pair conductors (5 pairs) AWG #20 (7 x 28) stranded, individually tinned copper:
  - Yellow/Yellow-Black
  - Blue/Blue-White
  - Orange/Orange-Green
  - Brown/Brown-White
  - Purple/Purple-White
- Aluminized polyester shield
- Drain wire AWG #22 (7 x 28) stranded, individually tinned copper
- Controlled electrical characteristics
- UL and cUL recognized

Physical Dimensions

- Outside diameter: 0.354 in. (9 mm)
- Minimum Bend Radius: 3.6 in (9.1 cm)
- Available in 500 ft., 1,000 ft., and 2,500 ft. (152 m, 305 m, and 760 m) spools

*Separate messenger wire required

For complete warranty information visit www.gtt.com.

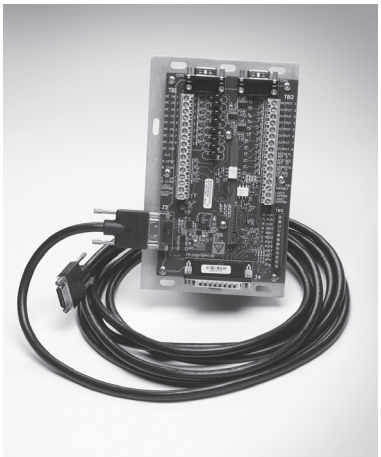
Global Traffic Technologies, LLC
7800 Third Street North
St. Paul, Minnesota 55128-5441
1-800-258-4610
651-789-7333
www.gtt.com

Global Traffic Technologies Canada, Inc.
157 Adelaide Street West
Suite 448
Toronto, ON M5H 4E7
Canada
1-800-258-4610

Building critical traffic connections℠

OPTICOM™ PRIORITY CONTROL SYSTEM
OPTICOM™ MODEL 768 AUXILIARY INTERFACE PANEL

OPTICOM™ SYSTEM COMPONENT FOR ENVIRONMENTS WITH INFRARED AND GPS TECHNOLOGY



Global Traffic Technologies, LLC (GTT), formed in 2007 from 3M's pioneering Intelligent Transportation Systems business, is the manufacturer of Opticom™ priority control systems and Canoga™ traffic sensing systems.

Global Traffic Technologies, LLC
7800 Third Street North
St. Paul, Minnesota 55128-5441
1-800-258-4610
651-789-7333
www.gtt.com

Global Traffic Technologies Canada, Inc.
157 Adelaide Street West
Suite 448
Toronto, ON M5H 4E7
Canada
1-800-258-4610

Description

Opticom™ Model 768 Auxiliary Interface Panel (AIP) provides a convenient method to interconnect Opticom™ Model 762 and 764 Phase Selectors with terminals inside a traffic cabinet. The 768 AIP is designed specifically for use with the Model 762 and 764 phase selectors. It is not intended to be used with other model phase selectors.

The Opticom™ Model 768 contains terminal blocks for wiring to the traffic cabinet signals, two DB-9 RS-232 communication ports, and a 44-pin connector for connecting legacy auxiliary interface panels and auxiliary harnesses. A twelve foot cable is included which connects the AIP to the Model 762 or 764 Phase Selector.

Features

- Accessible interconnections to cabinet wiring along the edge of card
- Rugged construction - circuit card affixed to 16 AWG aluminum mounting plate
- Connectors for auxiliary detector inputs and power can accommodate 16 to 28 AWG wires
- Connectors for all other inputs and outputs can accommodate 16 to 22 AWG wires
- Easy-to-read terminal designations

Applications:

The Model 768 AIP is used when any of the following features and/or capabilities is needed:

- Green sensing or green light verification
- Auxiliary infrared detector inputs
- Additional preempt outputs
  - Turn signal dependent operation (For 764 in GPS operation)
  - Separate outputs for high and low priority
- Clock sync input (In IR operation)
- Clock sync output (For 764 in GPS operation)
- Confirmation light outputs
- Disable outputs
- Two additional RS-232 COM ports
  - GPS data input (In IR operation)
  - GPS data output (For 764 in GPS operation)
  - Additional Serial COM port

The Model 768 AIP includes a connector for connecting an existing auxiliary harness or auxiliary interface panel to green sense and/or auxiliary detectors. Simply remove the old AIP or harness and connect it directly to the 768. If the existing harness or AIP is being used for other functions, it will be necessary to move the wires to the Model 768 AIP.

Physical Dimensions

Length: 7.25 in. (18.4 cm)
Width: 4.5 in. (11.4 cm)
Height: 1.0 in. (2.5 cm)
Weight (with cable): 1.4 lbs. (635 g)
Cable: 12 ft (3.6M)

For complete warranty information visit www.gtt.com.

Building critical traffic connections℠

OPTICOM™ PRIORITY CONTROL SYSTEM
OPTICOM™ MODEL 764 MULTIMODE PHASE SELECTOR

OPTICOM™ SYSTEM COMPONENT FOR ENVIRONMENTS WITH INFRARED AND GPS TECHNOLOGY

Description

The Opticom™ Model 764 Multimode Phase Selector is a plug-in, four-channel, dual-priority, multimode encoded signal device designed for use with both Opticom™ infrared system (IR) emitters and detectors and Opticom™ GPS radio/GPS intersection units and vehicle equipment. It can be installed directly into the input files of Type 170 traffic controllers equipped with priority phase selection software and in virtually any other traffic controller equipped with priority phase selection inputs and related software. Phase selectors are powered from AC mains or 24 VDC and contain their own internal power supply to support Opticom™ IR detectors and Opticom™ GPS radio/GPS units.

The Opticom™ Model 764 Multimode Phase Selector may be used in IR only applications, GPS only applications, or IR and GPS applications simultaneously.

The Opticom™ Model 760 Card Rack is required when input file space is not available. When used in GPS only mode, the Opticom™ Model 1040 Card Rack may also be used.

Opticom™ Model 764 Multimode Phase Selector recognizes and discriminates among three distinct Opticom™ IR emitter frequency rates via Opticom™ detectors: high priority, low priority and probe priority. Within each of these three frequency rates, the phase selectors further discriminate among 10 classes of vehicle identification codes, with 1,000 individual vehicle codes per class — 10,000 total per frequency rate. The Opticom™ Model 764 Multimode Phase Selector also recognizes three different priority levels transmitted by Opticom™ GPS vehicle equipment: high priority, low priority and probe priority. Within each of these three priority levels, the phase selectors further discriminate among 254 agency IDs, 15 classes of vehicle identification codes, with 10,000 individual vehicle codes per class — for more than 38 million total per priority level.

Opticom™ Model 764 Multimode Phase Selector internally records each system activation. Each entry contains:

- Intersection name
- Date and time of the activity
- Vehicle class code of the activating vehicle
- Activating vehicle's ID number
- Agency ID (GPS only)
- Channel called
- Priority of the activity
- Final green signal indications displayed at the end of the call
- Time spent in the final greens
- Duration of the activation
- If preempt has been requested and reason if not
- Turn signal status at the end of the call (GPS only)
- Entry, exit and average speed (GPS only)
- Relative priority level
- Conditional priority level

Global Traffic Technologies, LLC (GTT), formed in 2007 from 3M's pioneering Intelligent Transportation Systems business, is the manufacturer of Opticom™ priority control systems and Canoga™ traffic sensing systems.

GTT Building critical traffic connections℠

OPTICOM™ MODEL 764 MULTIMODE PHASE SELECTOR

OPTICOM™ SYSTEM COMPONENT FOR ENVIRONMENTS WITH INFRARED AND GPS TECHNOLOGY

Features

- IR only operation, GPS only operation, or simultaneous IR and GPS operation
- Four channels of detection
- Two auxiliary detectors per channel (IR)
- Records green signal displayed at end of preemption
- Compatible with encoded signal and non-encoded signal Opticom™ IR Emitters
- High and low priority as well as probe frequency discrimination
- Conditional priority for Transit Signal Priority (TSP) (when used with compatible AVL and/or passenger counter)
- "First-come, first-served" priority within each priority level
- Priority-by-class setting via the interface software
- Priority-by-direction setting via the interface software
- Direct installation into CA/NY Type 170 input files
- Automatic range setting using an encoded emitter (IR)
- Call bridging for both IR and GPS calls including mixed mode
- Low-priority output may be configured for first-come, first-served or all-channel active
- User-adjustable range setting up to 2,500 feet of operation
- Compatible with most traffic controllers
- 10/100Mb Ethernet communication on the front panel
- USB 2.0 communication on the front panel
- RS232 communications front port, and rear backplane and Auxiliary Interface Panel
- User-selected communications baud rate of 1,200 to 230,400 bits per second
- Customizable ID code validation
- Flexible programming options for priority control parameters
- Detailed current Opticom™ System parameter information
- History log of most recent Opticom™ infrared and GPS system activities (10,000 entries)
- 30,000 frequency/class/vehicle code ID combinations (IR)
- More than 38 million agency/class/vehicle code combinations (GPS)
- Front panel switches and diagnostic indicators for testing
- Accurate infrared signal recognition circuitry
- Precise output pulse
- Definitive call verification
- Regulated detector power supply (IR)
- Optically isolated outputs
- Two character display and keypad to enable diagnostics and test calls to each channel
- Display LED Indicators
  - High- and low-priority test calls
  - Reset to default parameters
  - Range setting
- User-settable range setting by ETA and/or distance (GPS only)
- Varied outputs depending on turn signal status of requesting vehicle (GPS only)
- IR detector inputs may be mapped to any channel.
- Diagnostic test
- Advanced built-in diagnostics and testing
- Tested to NEMA environmental and electrical test specifications

Accessories

- Opticom™ On-site Interface software package
- Opticom™ Model 768 Auxiliary Interface Panel
- Opticom™ Model 755 Four-Channel Adapter Card (optional)
- Opticom™ Model 760 Card Rack

Operating Parameters

- Four dual-priority and probe frequency channels
- "First-come, first-served" for vehicles with the same priority level (high or low)
- Priority override: always higher over lower
- Opticom™ GPS Radio/GPS Unit input
- Opticom™ Infrared System Detector input(s): one per channel on the card edge connector and two auxiliary per channel through the Opticom™ Model 768 Auxiliary Interface Panel
- Optional interface software for flexible programming options and call history
- LED indicators
  - Status
  - Radio (GPS mode)
  - Link (GPS mode)
  - High signal/call per channel
  - Low signal/call per channel
  - Two-digit status display
- Two character display and keypad to enable diagnostics and test calls to each channel
- Voltage: 89 to 135 VAC, 60 Hz at up to 500mA or 24 VDC at up to 1 Amp
- Temperature: -37°C to +74°C (-34.6°F to +165.2°F)
- Humidity: 5% to 95% relative
- CE certified
- NEMA TS-2 compliance
- FCC compliance

Physical Dimensions

Length: 7.0 in. (17.8 cm) x 8.2 in. (20.8 cm) including handle

Width: 2.3 in. (5.8 cm)

Height: 4.5 in. (11.4 cm)

Weight: 0.60 lbs. (272 g)

For complete warranty information visit www.gtt.com.

Building critical traffic connections℠

Global Traffic Technologies, LLC
7800 Third Street North
St. Paul, Minnesota 55128-5441
1-800-258-4610
651-789-7333
www.gtt.com

Global Traffic Technologies Canada, Inc.
157 Adelaide Street West
Suite 448
Toronto, ON M5H 4E7
Canada
1-800-258-4610

79-1000-0524-0 (D)

OPTICOM™ PRIORITY CONTROL SYSTEM
OPTICOM™ GPS SYSTEM INTERSECTION EQUIPMENT

OPTICOM™ SYSTEM COMPONENTS FOR ENVIRONMENTS WITH GPS TECHNOLOGY

Description

The Opticom™ GPS System assists authorized vehicles through signalized intersections by providing temporary right-of-way through the use of common traffic controller functions.

The Opticom™ GPS system consists of the following matched components:

Intersection Equipment

- Opticom™ Model 3100 GPS Radio Unit containing a GPS receiver with antenna and a 2.4 GHz spread spectrum transceiver with antenna

  –OR–

  Opticom™ Model 3101 GPS Radio Unit containing a GPS receiver and a 2.4 GHz spread spectrum transceiver, with Opticom™ Model 1050 GPS/Radio Antenna and Opticom™ Model 1072 GPS Cable Assembly
- Opticom™ Model 764 Multimode Phase Selector
- Opticom™ Model 768 Auxiliary Interface Panel
- Opticom™ Model 1040 GPS Card Rack or Opticom™ Model 760 Card Rack or Opticom™ Model 770 Card Rack
- Opticom™ Model 1070 GPS Installation Cable

Vehicle Equipment

- Opticom™ Model 2100 High Priority Radio/GPS Control Unit

  –OR–

  Opticom™ Model 2101 Low Priority Radio/GPS Control Unit
- Opticom™ Model 1050 GPS/Radio Antenna
- Opticom™ Model 2171 Vehicle Interface Cable

Opticom™ GPS system intersection equipment consists of the compact, weather resistant RF-energy-emitting Opticom™ Model 3100 GPS Radio Unit containing a GPS receiver with antenna and a 2.4 GHz spread spectrum transceiver with antenna. The radio unit is connected to an Opticom™ Model 764 Multimode Phase Selector via an 11-conductor radio/GPS cable.

The Opticom™ Model 764 Multimode Phase Selector can be installed directly into a CA/NY Type 33X input file or most NEMA traffic controllers equipped with priority phase selection software, or into virtually any other traffic controller equipped with priority phase selection inputs and related software.

When input file space is not available, an Opticom™ Model 760 Card Rack is required. An external 120 VAC power source provides the power that is required to operate the Opticom™ Model 764 Multimode Phase Selector. The phase selector provides power to the radio unit.

The Opticom™ Model 764 Multimode Phase Selector processes the signal from the Opticom™ Model 3100 GPS Radio Unit and activates outputs, which are connected to the preemption inputs on the traffic controller. There are four channel outputs accessible on the rear connector of the Opticom™ Model 764 Multimode Phase Selector and up to 12 additional channel outputs on the Opticom™ Model 768 Auxiliary Interface Panel.

Global Traffic Technologies, LLC (GTT), formed in 2007 from 3M's pioneering Intelligent Transportation Systems business, is the manufacturer of Opticom™ priority control systems and Canoga™ traffic sensing systems.

GTT | *Building critical traffic connections℠*

OPTICOM™ GPS SYSTEM INTERSECTION EQUIPMENT

OPTICOM™ SYSTEM COMPONENTS FOR ENVIRONMENTS WITH GPS TECHNOLOGY

Each channel output delivers a constant output for high-priority activation, and a pulsed output for low-priority activation. A high-priority signal received on a channel will override any low-priority activation. In certain modes of operation, outputs may be activated that are dependent on the state of the requesting vehicle's turn signal. Another mode provides separate constant outputs for high priority and low priority. The use of an Opticom™ Model 768 Auxiliary Interface Panel is required to access these additional modes and outputs.

Opticom™ GPS System intersection equipment has the following features:

- Four channels of detection
- Radio range of 2,500 feet
- User-settable range setting by ETA and/or distance
- Call bridging
- Precise preemption output pulse
- Optically isolated outputs
- Varied outputs depending on turn signal status of requesting vehicle
- High and low priority as well as probe frequency discrimination
- "First-come, first-served" priority within each priority level
- Low-priority output may be configured for first-come, first-served or all-channel active
- Priority-by-class and priority-by direction setting via the interface software
- 10/100Mb Ethernet and USB 2.0 communication on the front panel
- RS232 communications front port, rear backplane and Auxiliary Interface Panel
- History log of most recent Opticom™ GPS system activities (10,000 entries)
- More than 38 million agency/class/vehicle code combinations
- Customizable ID code validation
- Two character display, LEDs and keypad to enable diagnostics and place test calls to each channel
- Flexible programming options for priority control parameters
- Direct installation into CA/NY Type 33X input files
- Compatible with most traffic controllers
- Tested to NEMA environmental and electrical test specifications
- Meets FCC part 15 Class A specifications

Physical Dimensions

Opticom™ Model 764 Multimode Phase Selector
Length: 7.0 in. (17.8 cm) x 8.2 in. (20.8 cm) including handle
Width: 2.3 in. (5.8 cm)
Height: 4.5 in. (11.4 cm)
Weight: 0.60 lbs. (272 g)

Opticom™ Model 3100 GPS Radio Unit
Length: 9.0 in. (22.9 cm)
Width: 6.5 in. (16.5 cm)
Height: 6.0 in. (15.2 cm)
Weight: 1.8 lbs. (0.816 kg)

Opticom™ Model 3101 GPS Radio Unit
Length: 8.0 in. (20.3 cm)
Width: 4.5 in. (11.4 cm)
Height: 2.7 in. (6.9 cm)
Weight: 1.7 lbs. (0.771 kg)

Opticom™ Model 768 Auxiliary Interface Panel
Length: 7.25 in. (18.4 cm)
Width: 4.5 in. (11.4 cm)
Height: 1.0 in. (2.5 cm)
Weight with cable: 1.4 lbs. (635 g)
Cable: 12 ft (3.6 m)

Opticom™ Model 1040 GPS Card Rack/Opticom™ Model 760 Card Rack/Opticom™ Model 770 Card Rack
Length: 8.25 in. (21.0 cm)
Width: 5.25 in. (13.3 cm)
Height: 5.1 in. (12.9 cm)
Weight: 2.3 lbs. (1.043 kg)

Opticom™ Model 1050 GPS/Radio Antenna
Diameter: 2.85 in. (7.2 cm)
Height: 1.4 in. (3.5 cm)
Cable length: 15.0 ft. (4.6 m)
Weight with cables: 0.6 lbs. (0.30 kg)

Electrical

Opticom™ Model 764 Multimode Phase Selector
Voltage: 89 to 135 VAC, 60 Hz at up to 500mA or 24 VDC at up to 1 Amp

Environmental

Opticom™ Model 764 Multimode Phase Selector
Temperature: -37°C to +74°C (-34.6°F to +165.2°F)
Humidity: 5% to 95% relative

For complete warranty information visit www.gtt.com.

Building critical traffic connections℠

Global Traffic Technologies, LLC
7800 Third Street North
St. Paul, Minnesota 55128-5441
1-800-258-4610
651-789-7333
www.gtt.com

Global Traffic Technologies Canada, Inc.
157 Adelaide Street West
Suite 448
Toronto, ON M5H 4E7
Canada
1-800-258-4610