



Global Traffic  
Technologies

**Installation Manual**

**May 2011**

Opticom<sup>™</sup> Infrared System

Model 762 Phase Selector

Model 764 Phase Selector



# Installation Instructions

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## 1 About This Manual

**Please read, understand, and follow all safety information contained in these instructions before installing the system equipment. Save this installation manual and keep it near the equipment.**

If you are unsure about any part of this installation or of the potential hazards discussed, please contact your supervisor immediately.

### 1.1 Intended Use

The system is intended to assist authorized priority vehicles through signalized intersections by providing temporary right-of-way through vehicle operator interface to the system and through the use of common traffic controller functions. GTT has not evaluated this product for use in any other application.

### 1.2 Technical Support

If you have questions about the system, its use, or operation, please contact your dealer or call the GTT Technical Service department at 1-800-258-4610.

### 1.3 Safety Messages and Safety Labels

We include safety messages and labels in this manual to help you protect your safety and the safety of others.

**Please read these messages before proceeding with the installation.**

### 1.4 Safety Considerations

Please consider the following safety issues before beginning the installation of the Opticom™ System intersection equipment.

Although we have compiled this list of common safety considerations, it should not be considered as complete. It is not intended to take the place of your good judgment, training, and experience.

#### 1.4.1 Personal Safety Equipment and Clothing

Personal safety equipment and clothing including high visibility vests, hard hats, gloves, electrical shock or electrocution protection clothing and equipment, safety shoes, safety glasses, face shields, goggles, and hearing protection devices are just some of the items available to you.

Choose the right equipment for the job. If you are unsure of which safety equipment is recommended or appropriate for the job, ask your supervisor or foreman.

#### 1.4.2 Work Zone Traffic Control

Proper control of vehicle traffic is important during many procedures. When you switch the traffic controller to and from the flash mode we recommend that you have people trained in manual traffic control, such as police officers, assist you.

When you install devices that require you to position vehicles, equipment, or people in or near the roadway, it is important that you use appropriate work zone traffic control techniques, equipment, and procedures. Sometimes you may have to work on or near the roadway and these same techniques, equipment, and procedures should be used for your protection.

If you are unsure of which procedures are recommended or appropriate for the job, ask your supervisor or foreman.

## Installation Instructions

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### 1.4.3 Electric Shock

The possibility of electrical shock exists when installing intersection equipment, since connections must be made to open terminals within the traffic control cabinet which may have 120 VAC present. Follow proper work procedures and read and understand the safety messages in this manual.

As a trained installer of electrical equipment you are aware of the dangers associated with installation of electrical devices. Always be sure that the power to the equipment, and all associated equipment, is turned off before beginning any procedure. Use the equipment, techniques, and procedures that you learned during your training or apprenticeship or other electrical industry recognized safety procedures.

If you are unsure of which techniques, procedures, and protective equipment are recommended or appropriate for the job, ask your supervisor or foreman.

### 1.5 Disposal of Device

Please dispose of the device in accordance with all local, state, and federal laws and regulations.

\*The method of using the components of the Opticom system may be covered by US Patent Number 5172113.

# Installation Instructions

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## 2 Description

This section provides a general description of the Opticom™ infrared system and a detailed description of the intersection equipment. The Model 764 may also be used in GPS operation or simultaneous Infrared and GPS operation. Refer to the Opticom GPS intersection equipment installation manual for details on installing the GPS components,

### Opticom Infrared System

The Opticom Infrared system assists authorized priority vehicles through signalized intersections by providing temporary right-of-way through the use of common traffic controller functions.

The Opticom system consists of the following matched components:

- **Emitter** — Model 196 Emitter or higher.
- **Detector** — Model 711, 721, and 722 Detectors and the Model 138 Detector Cable.
- **Phase Selector** — Model 762 and 764 Phase Selectors.
- **Card Rack/Input File** — Model 760 Card Rack or a California/New York Type 170 Controller Input File.

### Operation Description

The emitter, with an appropriate emitter control switch, is mounted on the priority vehicle. It generates a series of pulses in the infrared wavelengths. These pulses are sensed by the detector mounted at the intersection. The detector converts the infrared energy into electrical signals that are transmitted by the detector cable to the phase selector in the traffic controller cabinet.

The phase selector discriminates between valid emitter signals and other sources of energy received by the detectors and activates its outputs in response to valid priority emitter signals. The phase selector outputs are connected to the traffic controller's inputs to request the traffic controller to deliver the desired green for the priority vehicle.

The card rack/input file provides the power and logic wiring for the phase selector, which plugs directly into a slot in the unit.

### Intersection Equipment Details

The Model 762 phase selector is a plug-in two channel, dual priority, encoded signal device. The Model 764 phase selector is a plug-in four channel, dual priority, encoded signal device. Both phase selectors are designed for use with Model 196 emitters or higher and Model 711, 721, and 722 detectors.

Both phase selectors can be installed directly into the input files of Type 170 traffic controllers equipped with priority phase selection software. They can also be installed directly into virtually any other traffic controller equipped with priority phase selection inputs and related software.

When input file space is not available, the Model 760 card rack is required. The phase selector is powered from 120 VAC or 24 VDC and contains its own internal power supply to support the detectors. The Opticom™ Infrared System Model 762 and 764 Phase Selectors recognize and discriminate between three distinct emitter frequency rates via detectors. Within each of these three frequency rates they further discriminate among 10 classes of vehicle identification codes. There are 1000 individual vehicle codes per class—10,000 total per frequency rate.

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 either channel will override any low priority activation. The probe frequency does not place a call request, but does log vehicles by ID number when they are in range.

## Installation Instructions

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This manual describes the installation of a Model 760 card rack (when required), and installation of a Model 762 and/or Model 764 phase selector into either a Model 760 card rack or a Type 170 input file. Figure 2-1 shows the intersection installation components including the phase selectors, card rack, input file, auxiliary interface panel, and the wiring harnesses and cables. The 9-pin harness connects the card rack to the traffic controller. The communication cable connects the phase selector to a modem or computer. The auxiliary interface panel cable connects the phase selector to the auxiliary interface panel. The Model 755 four-channel adapter card is used when are using an existing Model 360, 560 system chassis or a NEMA card rack that is wired for a two-channel phase selector.

### NOTE

**Illustrations and connections to the traffic controller may not be exactly as shown or described in this manual. Refer to the controller wiring diagram for correct terminal connections.**



# Installation Instructions

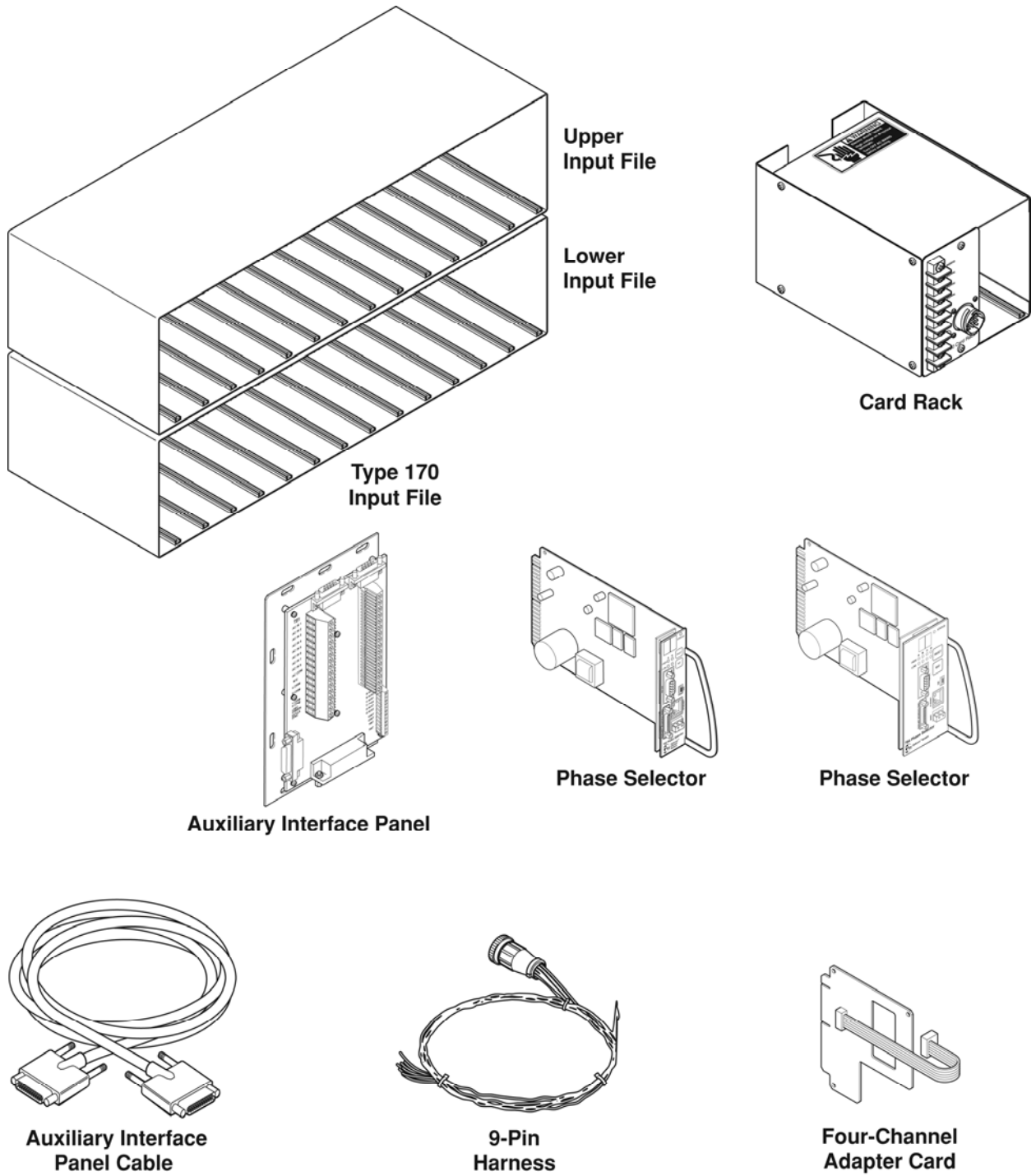


Figure 2-1 Intersection Components

# Installation Instructions

## 3 Powering the Phase Selector

The phase selector operates on either 120VAC 60Hz or 24 VDC. The phase selector then powers the rest of the Opticom intersection equipment. Powering the phase selector requires one of the following inputs:

Pin	Input
A	DC-
B	DC+ (24 VDC)
L	AC Ground
M	AC Neutral (AC-)
N	AC Hot (AC+)

**Table 3-1 Phase Selector Power Input**

If the phase selector detects both 24 VDC and 120 VAC, it will use 120 VAC  
See figure 9-1 for locations of pins A, B, L, M, N

Current Draw:

- When powered by 120VAC 60Hz, the Model 764 phase selector current draw is 80 mA
  - Add 15 mA for each 711 detector
  - Add 30 mA for each 721 or 722 detector
  - Add 15 mA for the 768 AIP
- When powered by 24 VDC, the Model 764 phase selector current draw is 110 mA
  - Add 15 mA for each 711 detector
  - Add 30 mA for each 721 or 722 detector
  - Add 40 mA for the 768 AIP
- When powered by 120VAC 60Hz, the Model 762 phase selector current draw is 80 mA
  - Add 15 mA for each 711 detector
  - Add 30 mA for each 721 or 722 detector
  - Add 15 mA for the 768 AIP
- When powered by 24 VDC, the Model 762 phase selector current draw is 110 mA
  - Add 15 mA for each 711 detector
  - Add 30 mA for each 721 or 722 detector
  - Add 40 mA for the 768 AIP

### 3.1 Powering on 120 VAC 60 Hz

Plug the phase selector into a card rack or slot that will provide 120 VAC on pins M and N.

### 3.2 Powering on 24VDC

Plug the phase selector into a card rack or slot that will provide 24 VDC on pins A and B.

It is also possible to power the phase selector on 24 VDC by providing power through the front DC connector. This connector is only used to provide power if neither 120 VAC nor 24 VDC is available on the card edge connector. The label on the removable 24 VDC connector shows the proper polarity. This connector is an input only it does not provide a 24VDC output.

## Installation Instructions

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### 4 Phase Selector Installation in Controller Cabinets with Existing Card Racks

CA/NY Type 170 (33X) controller cabinets and some NEMA cabinets have input files that will accept one or two phase selectors. Power input and preemption output wiring is factory installed in the cabinet for the phase selector. Power is provided for the phase selector at 120 VAC. Some cabinets may provide both 120 VAC and 24 VDC. In this case the phase selector will use 120 VAC.

#### WARNING

Improper or incomplete programming of the traffic controller may cause improper operation of the traffic signals, which may result in accidents and/or injuries. **To avoid this problem, verify that the operation of the traffic controller is appropriate for your needs before, during, and after actuation of the priority control inputs.** Improper operation of the traffic signals may result in unsafe driver action.

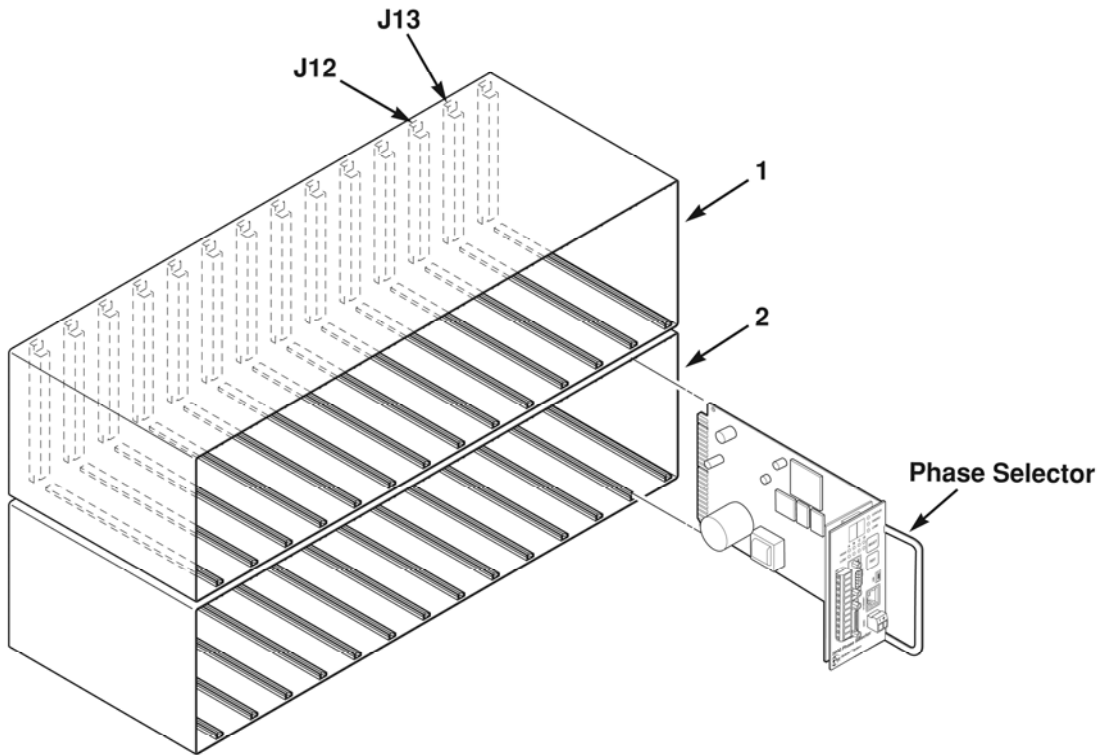
In 170/33X cabinets, two input file slots are dedicated for use by phase selectors. These slots are usually J12 and J13 in the lower input file. They are pre-wired and have a direct association with particular priority control inputs to the traffic controller. Both J12 and J13 supply two priority control inputs to the traffic controller. Refer to your cabinet drawings to verify the slots, which are usually referred to as EVA, EVB, EVC, or EVD.

The outputs from the phase selector are connected to the preemption inputs of the traffic controller. Each phase selector output must be connected to a separate controller preemption input. Consult the manual for your controller to determine if the preemption inputs are handled with the same priority. For some traffic controllers, preemption inputs one and two are intended for railroad and draw bridge preemption and are given precedence over the rest of the preemption inputs. When programming your priority control routines, it is important to use values that will allow the traffic controller to respond to a priority control request as quickly and safely as possible. If the routines are not programmed to respond quickly enough, the requesting vehicle may not receive a green light in time to travel through the intersection safely.

Additional outputs are available on the model 768 auxiliary interface panel. See section 7-5 for details on the additional outputs if needed.

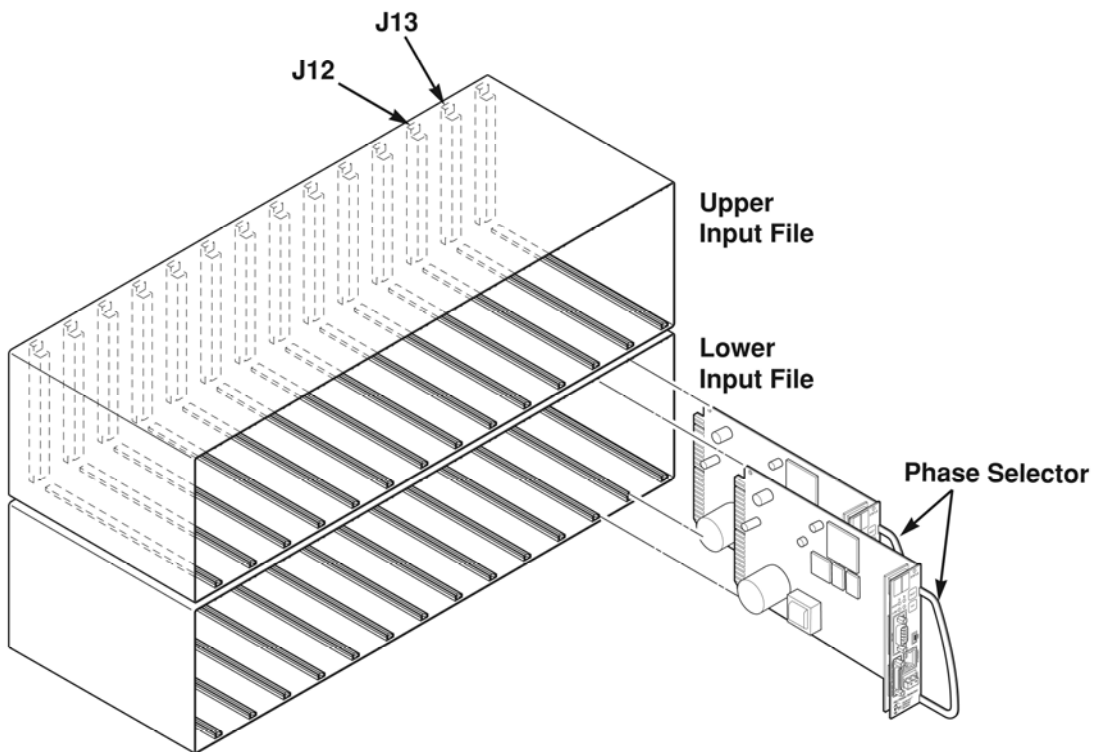
1. Install the phase selector into slot J13 of the lower input file, making sure it is fully seated. See Figure 4-1.
2. Or install two 2-channel phase selectors in slots J12 & J13, making sure that they are fully seated. See Figure 4-2.

# Installation Instructions



Opticom-511R-2

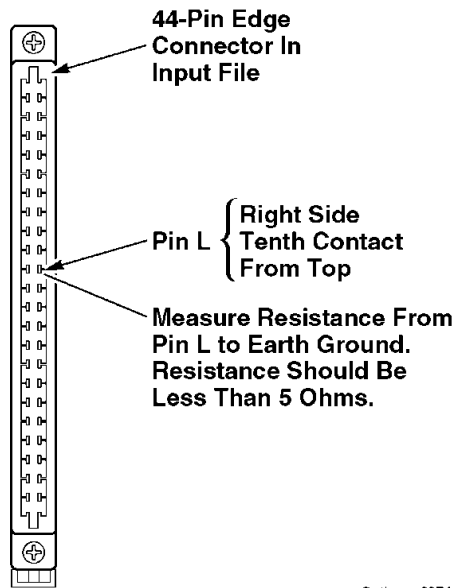
Figure 4-1 764 Phase Selector Installation Using Slot J13



Opticom-203A-2

Figure 4-2 Two 762 Phase Selector Installation Using Slots J12 & J13

# Installation Instructions



Opticom-397A

Figure 4-3. Input File Continuity Test

## 4.1 Potential for Electrical Shock

A potential exists for a low-current electrical shock (less than 4.5 mA) caused by leakage current in the power supply section of the phase selectors. You may experience this low-current shock when you touch the front of the phase selector, when you insert the phase selector into its slot in the input file, or when you remove the phase selector from its slot.

You can minimize this shock potential by making sure that pin L of the card edge connector in the 170 type controller input file is grounded properly to earth ground. If pin L is not connected to earth ground, your risk of exposure to this shock potential increases.

Use the following procedure to verify that pin L is connected properly to earth ground.

### ⚠ WARNING

This procedure may expose you to AC voltage and the risk of electric shock or electrocution. **Turn off the AC mains and use accepted and recognized safety precautions to avoid exposure to the risk of electric shock or electrocution.** Electric shock may cause severe injury or death.

### ⚠ CAUTION

This procedure must be performed in an Electro-Static Discharge (ESD) free environment. **Failure to perform this procedure in the proper environment may damage the equipment.**

## Installation Instructions

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1. Turn off AC power to the input file.
2. Remove the phase selector from the input file slot and place it in a static-free bag. Do this for all phase selectors in your system.
3. Locate pin L on the 44-pin edge connector of each phase selector slot and verify continuity to earth ground. See Figure 4-3.
  - a) Set an ohmmeter to its lowest resistance scale.
  - b) Measure the resistance between pin L and earth ground. If the resistance is less than 5 ohms, pin L is grounded properly.
4. If the resistance is greater than 5 ohms, inspect the input file wiring and repair and/or replace as necessary to correct the problem. Then retest the resistance.

### 5 Phase Selector Installation in NEMA Cabinets using 760 Card Rack

NEMA controllers usually require a card rack. The phase selector plugs directly into the card rack which then sits on a shelf in the traffic controller cabinet. The card slot in the card rack is intended to be used with a single phase selector. The edge connector is wired to connector J1 on the card rack front panel, which is connected (through the 9-pin harness) to the traffic controller. The card rack harness is connected to 120 VAC to power the phase selector. The preempt outputs are then wired to the appropriate preempt input terminal in the controller cabinet. See the cabinet drawing to determine the proper location.

The phase selector supplies four outputs to the traffic controller.

Additional outputs are available on the model 768 auxiliary interface panel. See section 7-5 for details on the additional outputs if needed.

The outputs from the phase selector are connected to the preempt inputs of the traffic controller. Each phase selector output must be connected to a separate controller preempt input. Consult the manual for your controller to determine if the preempt inputs are handled with the same priority. For some traffic controllers, preempt inputs one and two are intended for railroad and draw bridge preempt and are given precedence over the rest of the preempt inputs.

When programming your priority control routines, it is important to use values that will allow the traffic controller to respond to a priority control request as quickly and safely as possible. If the routines are not programmed to respond quickly enough, the requesting vehicle may not receive a green light in time to travel through the intersection safely.

#### WARNING

This procedure may expose you to AC voltage and the risk of electric shock or electrocution. **Turn off the AC mains and use accepted and recognized safety precautions to avoid exposure to the risk of electric shock or electrocution.** Electric shock may cause severe injury or death.

#### WARNING

Improper or incomplete programming of the traffic controller may cause improper operation of the traffic signals, which may result in accidents and/or injuries. **To avoid this problem, verify that the operation of the traffic controller is appropriate for your needs before, during, and after actuation of the priority control inputs.** Improper operation of the traffic signals may result in unsafe driver action.

## Installation Instructions

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1. Place the card rack at the desired location in the controller cabinet.
2. Install the phase selector into the card rack making sure it is fully seated. See Figure 5-2.
3. Route the 9-pin harness wires to their terminals.
4. Strip 1/4-inch (6 mm) of insulation from each wire to be used.
5. Install a spade lug on each wire and connect it to the appropriate terminal. See Figure 5-1 and Table 5-1.
6. Locate the controller terminals for AC+, AC-, chassis ground and connect these wires.
7. Power input range: 95 to 135 VAC, 60 Hz.
8. Connect the AC wires after the circuit breaker and surge suppression devices.
9. Connect the logic ground wire to a logic ground/logic common terminal.
10. Connect the priority output wires to the appropriate preempt inputs.
11. Connect plug P1 of the 9-pin harness to connector J1 on the card rack front panel.

Wire Color	Pin Number	Function
Black	1	115 VAC (AC+)
White	2	AC return (AC-)
Green	3	Chassis ground
	4	Not used
Gray/White	5	Rear output 1
Blue/White	6	Rear output 2
Violet/White	7	Rear output 3
Brown/White	8	Rear output 4
Gray/Black	9	Logic ground

**Table 5-1 9-Pin Harness Wiring 760 card rack**

# Installation Instructions

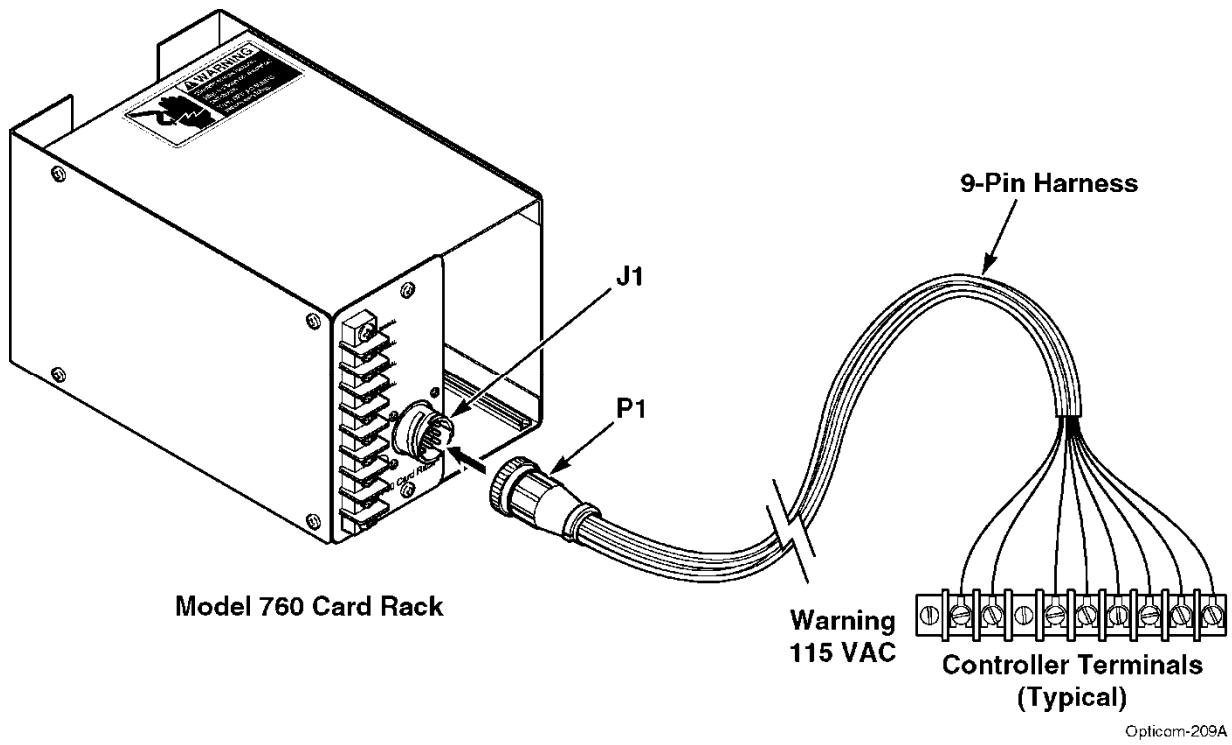


Figure 5-1 9-Pin Harness Wiring

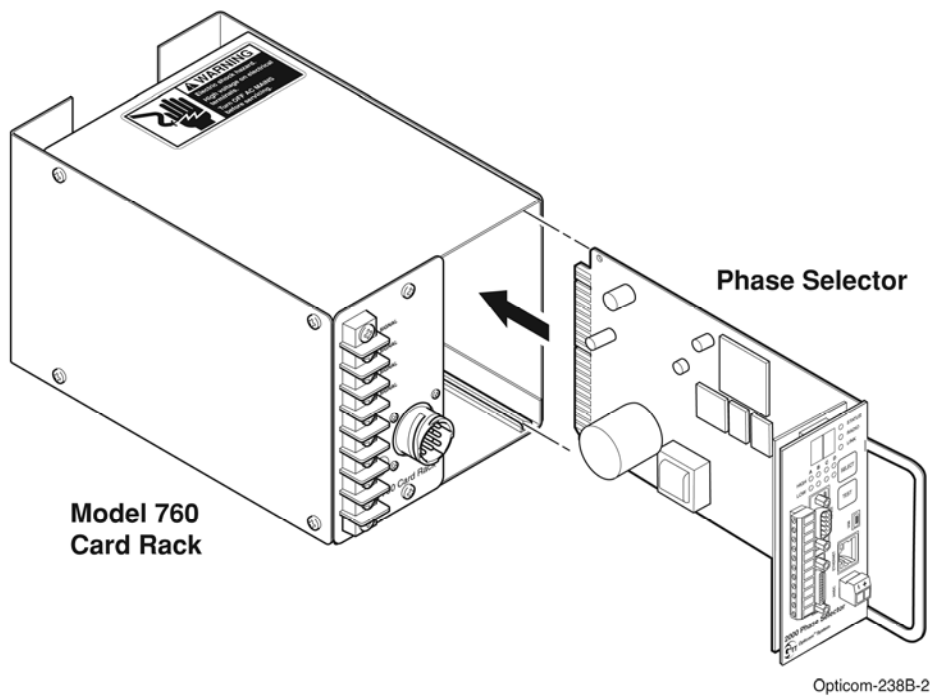


Figure 5-2 Phase Selector Installation



# Installation Instructions

## 6 Model 755 Four Channel Adapter Card and other Model Card Racks

If you are using your Model 764 phase selector in an existing model 360 or 560 system chassis or a NEMA type card rack that is wired for two, two-channel phase selector, you will need to use a model 755 four-channel adapter card.

The Model 360 and 560 system chassis have slots for two, two-channel phase selectors. The channel 1 and 2 IR detector inputs and preemption outputs are wired to one of these slots, and the channel 3 and 4 IR detector inputs and preemption outputs are wired to the other slot.

The Model 755 four-channel adapter card is needed to connect the channel 1 and 2 detector inputs and preemption outputs to the four channel phase selector.

1. Connect the ribbon cable from the model 755 four-channel adapter card to the black rectangular socket on the phase selector. See Figure 6-1.
2. Slide the adapter card into the channel 1 / channel 2 slot of the Model 360 or 560 system chassis or the NEMA type card rack, making sure it is fully seated.
3. Slide the phase selector into the channel 3 / channel 4 slot of the system chassis or card rack, making sure it is fully seated.

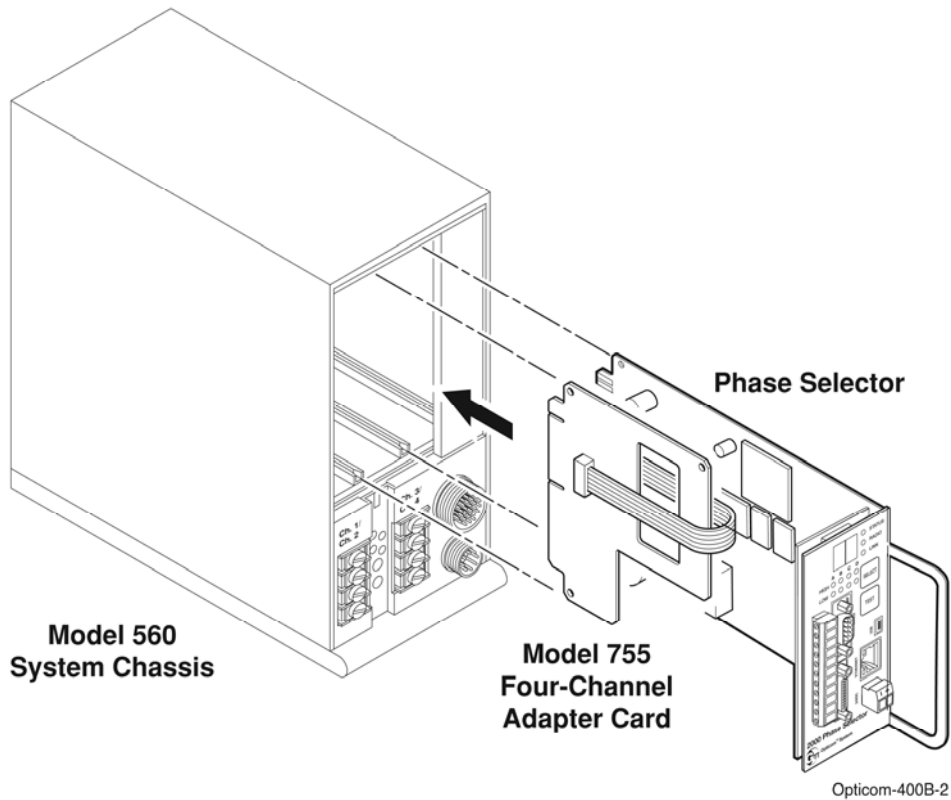


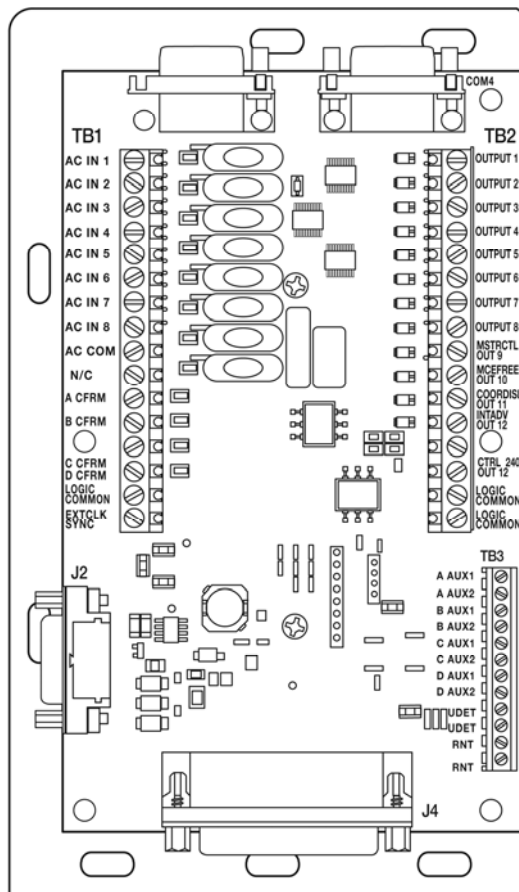
Figure 6-1 Model 755 Adapter Card

# Installation Instructions

## 7 Model 768 Auxiliary Interface Panel (AIP)

The model 768 auxiliary interface panel (AIP) is an interface device designed to provide connections between the phase selector and the traffic control cabinet wiring. It provides a breakout of the AIP connector on the front of the phase selector. The auxiliary interface panel is required for the following:

- Installations requiring more than four outputs
- Green sense
- Time Sync input or output operation
- Access to RS-232 COM ports three and four
- Connections for auxiliary detector inputs
- Confirmation lights controlled by the phase selector
- Connector for existing green sense harnesses and auxiliary interface panels.



**Auxiliary Interface Panel**

Opticom-0004-1

**Figure 7-1 Model 768 Auxiliary Interface Panel**

# Installation Instructions

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## 7.1 Auxiliary Interface Panel Installation

### Notes:

- See tables 7-1, 7-2, 7-3 for a description of the connectors and terminal strips
- Wire gauges from 22 to 16 AWG may be used to connect from the auxiliary interface panel to the traffic control cabinet wiring.
- Some auxiliary interface panel terminals may not be used in any given installation.

**⚠ WARNING**

This procedure may expose you to AC voltage and the risk of electric shock or electrocution. **Turn off the AC mains and use accepted and recognized safety precautions to avoid exposure to the risk of electric shock or electrocution.** Electric shock may cause severe injury or death.

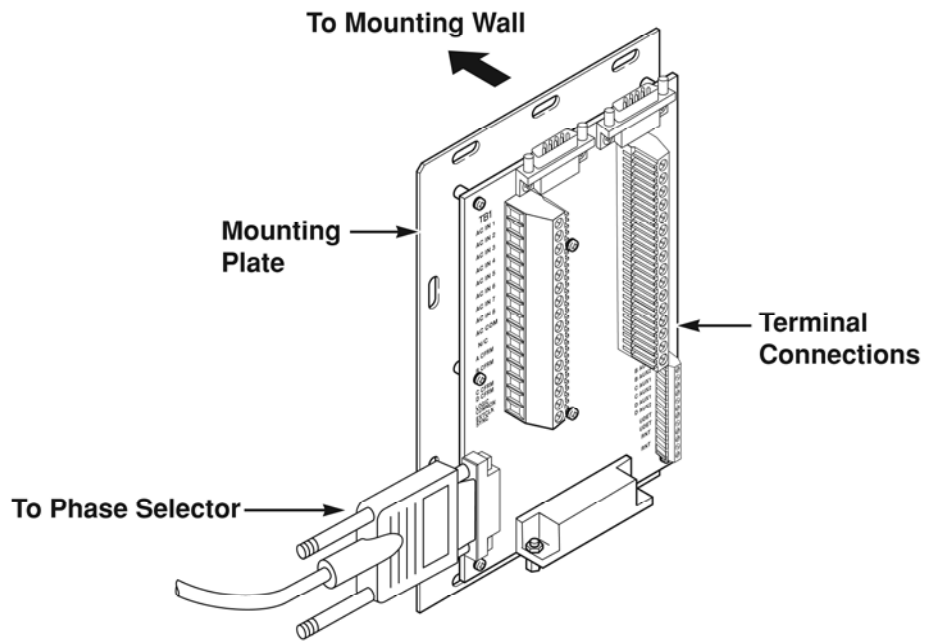
**⚠ Avertissement**

Cette opération peut vous exposer à une tension du courant alternatif et aux risques de chocs électriques ou d'électrocution. **Couper le courant alternatif et utiliser les mesures de précaution acceptées et reconnues pour prévenir tout risque de choc électrique ou d'électrocution.** L'électrocution peut causer des blessures graves ou la mort.

1. Determine a suitable location for the auxiliary interface panel in the traffic control cabinet. See Figure 7-2.
2. Use the mounting plate as a template and mark where you want to drill holes or use spring nuts to attach to the cabinet mounting channel.
3. Drill the holes and fasten the panel to the interior wall with user-supplied fasteners or use spring nuts to attach to the cabinet mounting channel.
4. Connect one end of the auxiliary interface panel cable to the connector labeled AIP on the front panel of the phase selector and the other end to J2 on the auxiliary interface panel. See Figure 7-2.

# Installation Instructions

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Opticom-207A-2

Figure 7-2 Model 768 Auxiliary Interface Panel Installation

# Installation Instructions

## 7.2 Green Sense Wiring

### **WARNING**

This procedure may expose you to AC voltage and the risk of electric shock or electrocution. **Turn off the AC mains and use accepted and recognized safety precautions to avoid exposure to the risk of electric shock or electrocution.** Electric shock may cause severe injury or death.

### **Avertissement**

Cette opération peut vous exposer à une tension du courant alternatif et aux risques de chocs électriques ou d'électrocution. **Couper le courant alternatif et utiliser les mesures de précaution acceptées et reconnues pour prévenir tout risque de choc électrique ou d'électrocution.** L'électrocution peut causer des blessures graves ou la mort.

### **Note:**

**Green sense inputs may be 89-135VAC, 57-63 Hz.**

1. Locate and identify the load bay field wire connections (AC+) for each phase green in the traffic control cabinet.
2. Determine the appropriate length of wires required to connect the auxiliary interface panel to the wiring points in the load bay of the traffic control cabinet.
3. Wire gauges from 22 to 16 AWG may be used.
4. Strip 1/4 inch (6 mm) of insulation from both ends of the wires being used.
5. Insert one end of each wire into the desired terminal of the auxiliary interface panel and tighten the screw. (For example, Phase 1 green is labeled AC IN 1 on terminal block TB1.)
6. Repeat step 4 for all desired phase greens.
7. Note: Do not connect green sense wires to any phases that are not being used.
8. Route the wires through the traffic control cabinet to the AC side of the load switches in the load bay. Install spade lugs on the wires.
9. Insert one wire at a time into the correct terminal in the load bay and tighten the screw.
10. Locate and identify the AC neutral connection in the traffic control cabinet.
11. Insert one end of the wire into the AC neutral terminal (AC COM on TB1) of the auxiliary interface panel and tighten the screw.
12. Route the wire through the traffic control cabinet to the AC neutral terminal. Install a spade lug and connect the wire to the AC neutral terminal.
13. Verify that your wiring is correct and the connections are tight.
14. Verify that the green sense wires are connected correctly.
  - a) To do this, open the On-site software and press the current activity button, compare the current greens displayed on the bottom of the window to the active greens indicated on the controller or conflict monitor/MMU.
15. Reconnect any green sense wires that may be incorrect.

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## 7.3 Confirmation Light Wiring

The Opticom™ Infrared System Model 768 Auxiliary Interface Panel confirmation light outputs are used to activate customer-provided confirmation lights in response to an approaching high priority vehicle. The behavior of the confirmation lights is programmed using the On-site software.

Each confirmation light is directed toward an approach in the intersection. That approach direction corresponds to one of the channels on the phase selector. The installer determines the relationship between approach direction and channel by the detector wiring.

Verify the relationship between the approach directions and channels before starting the installation and then configure the behavior of the confirmation light using the On-site software.

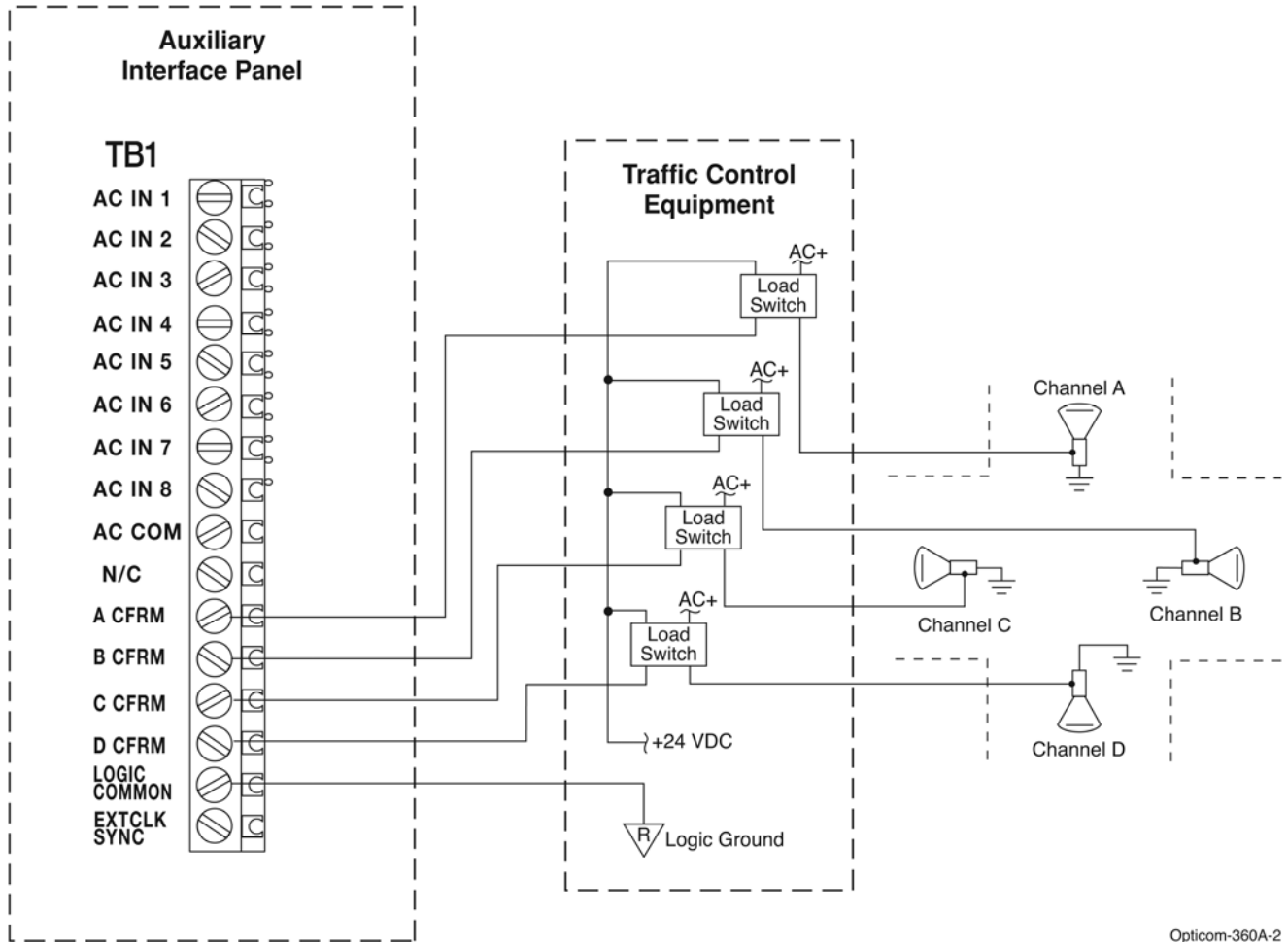
### 7.3.1 Confirmation Light Wiring with Load Switch Interface

#### **WARNING**

This procedure may expose you to AC voltage and the risk of electric shock or electrocution. **Turn off the AC mains and use accepted and recognized safety precautions to avoid exposure to the risk of electric shock or electrocution.** Electric shock may cause severe injury or death.

1. Locate and identify the input connections in the traffic control cabinet for each load switch that switches power to the confirmation lights.
2. Determine the appropriate length of wire required to connect the auxiliary interface panel to the wiring points for the load switches.
3. Strip 1/4-inch of insulation from both ends of the wires being used.
4. Wire gauges from 22 to 16 AWG may be used.
5. Insert one end of each wire into the desired terminal of the auxiliary interface panel and tighten the screw. Connect wires to terminals A CFRM, B CFRM, C CFRM, and D CFRM. See Figure 7-3.
6. Route the wires through the traffic control cabinet to the load switches in the load bay.
7. Install spade lugs on the wires and insert one wire at a time into the correct terminal in the load bay and tighten the screws.
8. Connect a wire to one of the LOGIC COMMON terminal of the auxiliary interface panel. Install a spade lug on the other end of the wire and connect it to the traffic controller logic ground. See Figure 7-3.
9. Connect the controller +24 VDC power source to each of the four confirmation light load switches.
10. Complete the configuration light interface wiring and field wiring as shown in Figure 7-3.
11. Verify that your wiring is correct, and the connections are tight.
12. Select the appropriate confirmation light pattern using the On-site software. See the On-site help file for details

# Installation Instructions



Opticom-360A-2

Figure 7-3 Confirmation Light Wiring with Load Switch Interface

## Installation Instructions

---

### 7.3.2 Confirmation Light Wiring with Electromechanical Relay Interface

This section describes confirmation light using customer supplied relays. The following is recommended specifications for the electromechanical relay:

Use a 24 VDC relay with a coil impedance of approximately 1000 ohms. The maximum amount of current that the phase selector output is designed for is 50 mA.

The relay should have a diode across the coil. Use a 1N4004 or equivalent diode.

The following relay manufactured by IDEC meets the above listed requirements:

- Relay: RH1B-UD-DC24V
- Socket: SH1B-05
- This relay contains a diode, so the diode shown in Figure 7-4 is not needed.
- This relay is available from Newark Electronics and other electronics supply houses.

#### Notes:

- **For applications with frequent activations, it is recommended that a solid-state relay be used in place of an electro-mechanical relay. A load switch would be another option.**
- **Omron G3NA-205B-DC5-24**
- **This relay is available from Digikey [www.digikey.com](http://www.digikey.com), (p/n Z165-ND) and other electronics supply houses.**

#### **WARNING**

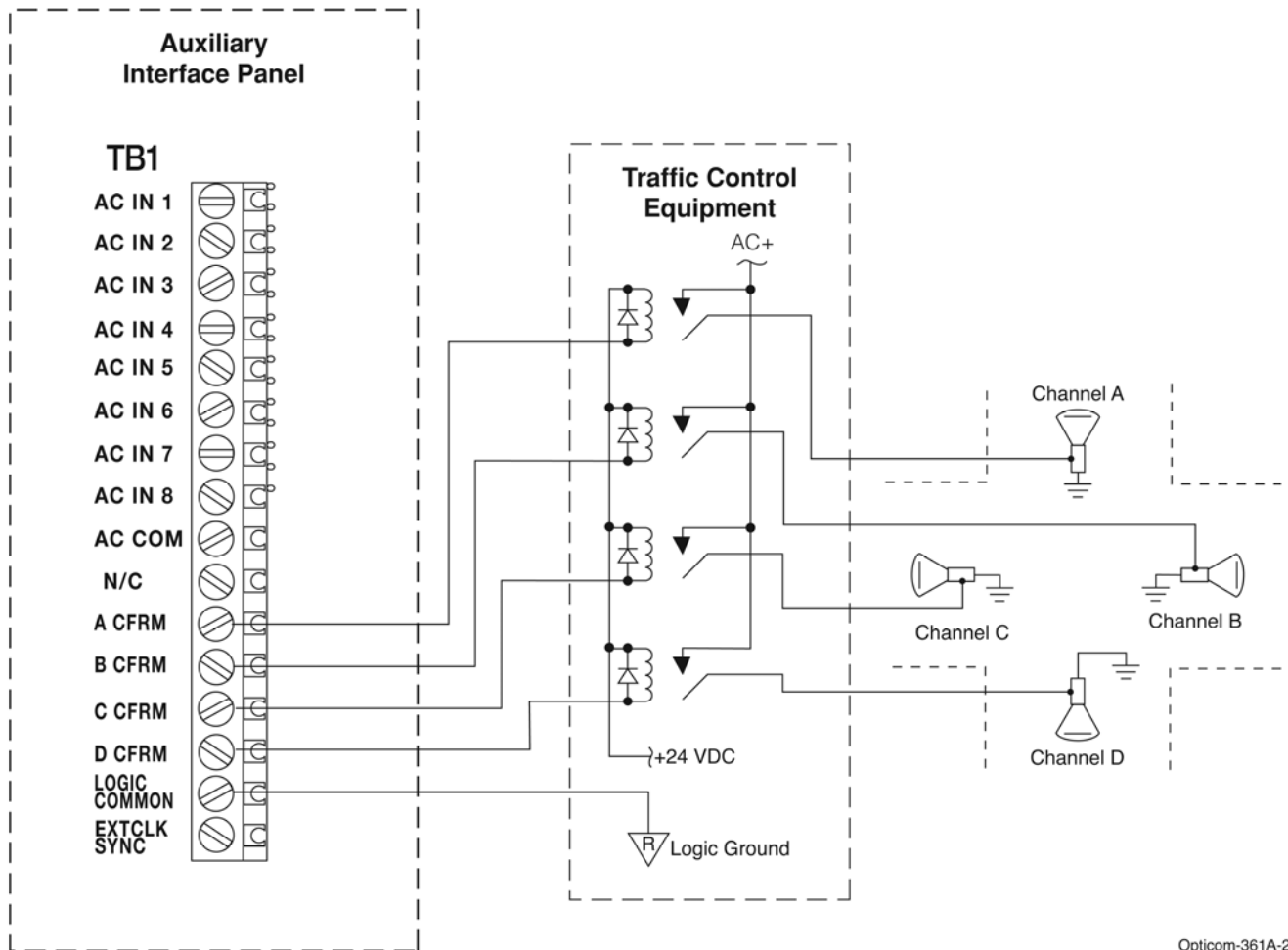
This procedure may expose you to AC voltage and the risk of electric shock or electrocution. **Turn off the AC mains and use accepted and recognized safety precautions to avoid exposure to the risk of electric shock or electrocution.** Electric shock may cause severe injury or death.

1. Locate and identify the input connections in the traffic control cabinet for each electromechanical relay that switches power to the confirmation lights.
2. Place a diode (1N4004 or equivalent) across the input to each electromechanical relay to prevent damage to the Phase Selector. See Figure 7-4.
3. Determine the appropriate length of wire required to connect the auxiliary interface panel to the wiring points for the relays.
4. Wire gauges from 22 to 16 AWG may be used.
5. Strip 1/4-inch (6 mm) of insulation from both ends of the wire being used.
6. Insert one end of the wire into the desired terminal of the auxiliary interface panel and tighten the screw. Connect wires to terminals A CFRM, B CFRM, C CFRM, and D CFRM. See Figure 7-4.
7. Route the wires through the traffic control cabinet to the electromechanical relays in the load bay.



## Installation Instructions

8. Install spade lugs on the wires and insert one wire at a time into the correct terminal in the load bay and tighten the screws.
9. Connect a wire to one of the LOGIC COMMON terminals of the auxiliary interface panel. Install a spade lug on the other end of the wire and connect it to the traffic controller logic ground. See Figure 7-4.
10. Connect a +24 VDC power source to each of the four confirmation light relays as shown in Figure 7-4.
11. Complete the configuration light interface wiring and field wiring as shown in Figure 7-4.
12. Verify that your wiring is correct and the connections are tight.
13. Select the appropriate confirmation light pattern using the On-site software. See the On-site help file for details.



Opticom-361A-2

**Figure 7-4 Confirmation Light Wiring with Electromechanical Relay Interface**

## Installation Instructions

---

### **7.4 Connecting Existing Harnesses to the Model 768 Auxiliary Interface Panel**

If you are upgrading from a previous generation of Opticom equipment and the current installation has an auxiliary interface panel or auxiliary harness/green sense harness you may be able to plug the existing harness/cable into the model 768 auxiliary interface panel so that rewiring may not be necessary. See figure 7-5

Not all functions will be available; in some cases it will be necessary to move wires from the existing model auxiliary interface panel to the new 768 auxiliary interface panel. In those cases it is recommend that the existing auxiliary panel be removed and all wires moved over to the 768.

#### **7.4.1 Existing IR installation using a Model 757 Auxiliary Harness**

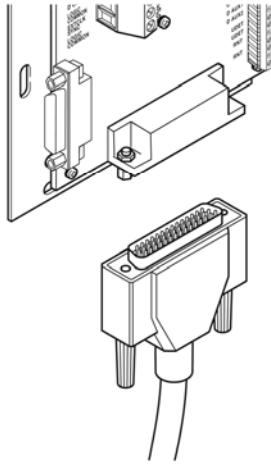
You may plug the 44 pin connector from the model 757 into the 44 pin connector on the 768. No rewiring is needed to use current green sense and auxiliary detector connections.

#### **7.4.2 Existing IR Installation using a Model 758 Auxiliary Interface Panel**

You may plug the 44 pin connector from the model 758 into the 44pin connector on the 768. No rewiring is needed to use current green sense, auxiliary detector and confirmation light connections.

If you are using the model 758 for additional functions such as separate output for high and low priority output, it is necessary to remove those connections from the 758 and connect them to the 768. In this case it is recommended that the 758 panel be completely removed and all connections be moved to the 768.

If you are using the model 758 for additional functions such as manual control enable, the model 762/764 phase selectors do not currently support this function. It is recommended that a model 752N/754N continue to be used in this intersection.



Opticom-207B-2

**Figure 7-5 Connecting existing Harness/AIP cable**

### 7.5 Additional Output Connections

If your installation requires more than 4 outputs or you prefer to use the outputs on the auxiliary interface panel, it is necessary to make additional connections between the auxiliary interface panel and the traffic control cabinet wiring. Outputs for the Time Sync output function are also available on the AIP. See the On-site software help file for details.

Table 7-1 shows the function of the auxiliary interface panel outputs for the various modes of operation.

1. Determine the appropriate length of the wires required to connect the auxiliary interface panel to the wiring points in the traffic control cabinet.
2. Strip 1/4 inch of insulation from both ends of the wires being used.
3. Insert one end of each wire into the desired terminal of the auxiliary interface panel and tighten the screw.
4. Repeat step 3 for all desired connections.
5. Route the wires through the traffic control cabinet. Install spade lugs on the wires.
6. Insert one wire at a time into the correct terminal and tighten the screw.
7. Verify that your wiring is correct, and the connections are tight.
8. Use the configuration software to make the appropriate assignments for the outputs.
9. When using any output on the auxiliary interface panel, you must make a connection between one of the Logic Common terminals on the auxiliary interface panel and the logic common terminal on your controller. If you do not make this connection the auxiliary interface panel outputs will not work.

## Installation Instructions

---

Output	Terminal Block & Signal	Function
1	TB2 OUTPUT 1	Assignable for Preempt, TSP
2	TB2 OUTPUT 2	Assignable for Preempt, TSP
3	TB2 OUTPUT 3	Assignable for Preempt, TSP
4	TB2 OUTPUT 4	Assignable for Preempt, TSP
5	TB2 OUTPUT 5	Assignable for Preempt, TSP
6	TB2 OUTPUT 6	Assignable for Preempt, TSP
7	TB2 OUTPUT 7	Assignable for Preempt, TSP
8	TB2 OUTPUT 8	Assignable for Preempt, TSP
9	TB2 MSTRCTL (OUT 9)	Assignable for Preempt, TSP
10	TB2 MCFREE (OUT10)	Assignable for Preempt, TSP
11	TB2 COORDISOL (OUT 11)	Assignable for Preempt, TSP
12	TB2 INTADV (OUT 12)	Assignable for Preempt, TSP
13	TB1 A CFRM	Channel A Confirmation light
14	TB1 B CFRM	Channel B Confirmation light
15	TB1 C CFRM	Channel C Confirmation light
16	TB1 D CFRM	Channel D Confirmation light
LOGIC COMMON	TB1 or TB2 LOGIC COMMON (3 available)	Logic Common
Controller 24 VDC	TB 2 CTRL 24V	*To use a signal from the traffic controller to activate the inhibit input, connect to Controller +24 VDC.
INHIBIT	TB 2 INHIBIT	* Connect to ground to disable all outputs

**Table 7-1 Function of AIP outputs**

## Installation Instructions

---

Terminal Block & Signal	Function
TB1 AC IN 1	Phase 1 green sense input
TB1 AC IN 2	Phase 2 green sense input
TB1 AC IN 3	Phase 3 green sense input
TB1 AC IN 4	Phase 4 green sense input
TB1 AC IN 5	Phase 5 green sense input
TB1 AC IN 6	Phase 6 green sense input
TB1 AC IN 7	Phase 7 green sense input
TB1 AC IN 8	Phase 8 green sense input
AC COM	AC Common (Neutral) for Green Sense
EXTCLK SYNC	External clock sync input
TB3 A AUX1	Channel A auxiliary IR detector input 1
TB3 A AUX2	Channel A auxiliary IR detector input 2
TB3 B AUX1	Channel B auxiliary IR detector input 1
TB3 B AUX2	Channel B auxiliary IR detector input 2
TB3 C AUX1	Channel C auxiliary IR detector input 1
TB3 C AUX2	Channel C auxiliary IR detector input 2
TB3 D AUX1	Channel D auxiliary IR detector input 1
TB3 D AUX2	Channel D auxiliary IR detector input 2
TB 3 VDET (2 available)	+24 VDC to power IR detectors
TB3 RTN (2 available)	DC return to power IR detectors

**Table 7-2 Function of AIP inputs**

Connector	Function
J2	Connector for cable to connect auxiliary interface panel to the phase selector
J4	Connector for exiting auxiliary harness or auxiliary interface panel
COM 3	* RS-232 COM port 3
COM 4	* RS-232 COM port 4
	*set baud rate and protocol with software, null modem adapter may be needed

**Table 7-3 Function of AIP Connectors**

# Installation Instructions

---

## 8 Detector Connections

See the model 711/721/722 installation manual for details on locating, mounting and wiring infrared detectors to the phase selector.

## 9 Phase Selector Pin Index

This section is a pin index and diagram of the rear card edge connector. It also contains the pin index of the 11-pin radio/GPS connector and DC Input connector. See section 12 for a pin index of the communication ports.

Pin	Function
1	Radio transmit (+)
2	Radio transmit (-)
3	Radio receive (+)
4	Radio receive (-)
5	Radio clock (+)
6	Radio clock (-)
7	GPS power
8	Common
9	Radio power
10	Common
11	Earth ground

**Table 9-1 Phase Selector Radio/GPS Connector Pin Index**

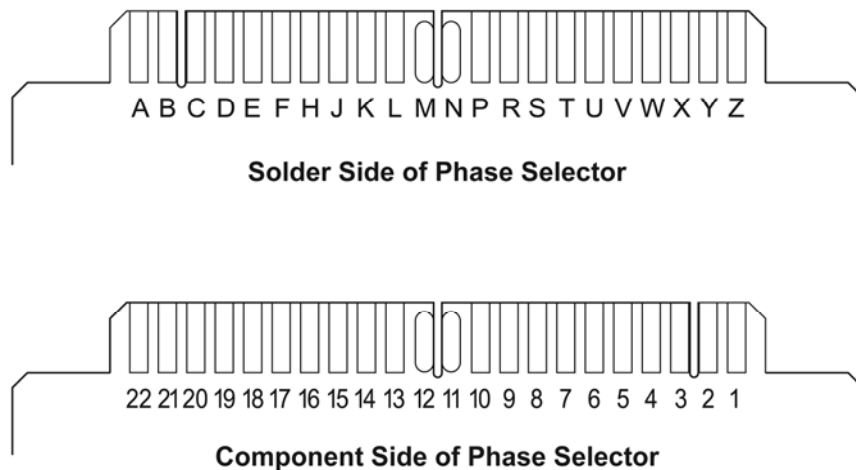
Pin	Function
1	DC- Input
2	DC + Input

**Table 9-2 DC Input Pin Index**

## Installation Instructions

Pin	Function
A	DC ground input
B	24 VDC + input
C	Not used
D	Channel A primary detector input (not used in GPS only mode)
E	Detector 24 VDC power output (not used in GPS only mode)
F	Channel A output, collector (+)
H	Channel A output, emitter (-)
J	Channel B primary detector input (not used in GPS only mode)
K	Detector ground (not used in GPS only mode)
L	Earth ground
M	AC- in (neutral)
N	AC+ in (hot)
P	Channel C primary detector input
R	Detector 24 VDC power output
S	Channel C output, collector (+)
T	Channel C output, emitter (-)
U	Channel D primary detector input
V	Detector ground (not used in GPS only mode)
W	Channel B output, collector (+)
X	Channel B output, emitter (-)
Y	Channel D output, collector (+)
Z	Channel D output, emitter (-)
19	TXD (data out)
21	RXD (data in)

**Table 9-3 Phase Selector Edge Connector Pin Index**



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**Figure 9-1 Phase Selector Edge Connector Pin Letters and Numbers**

# Installation Instructions

## 10 Communication Ports

Phase selectors have multiple communication ports:

- One Ethernet port
- One USB port
- Four RS-232 ports

### 10.1 Ethernet Port

The default address for the Ethernet port is:

<b>IP Address</b>	192.168.0.1
<b>TCP Port</b>	5000
<b>UDP Port</b>	6000

**Table 10-1 Ethernet Port Default settings**

- The address and port numbers in the phase selector may be changed using the On-site or CMS software. See the On-site and CMS help files for details.
  - Record the new address and port numbers so that you can communicate with the phase selector.
  - It is possible to reset the IP settings see section 13-2 for details.
- Connect a standard Ethernet cable between the Ethernet port on the phase selector and the Ethernet network device that you will use to communicate with the phase selector.

<b>Pin</b>	<b>Function</b>
1	Data 1+
2	Data 1 -
3	Data 2 +
4	Not used
5	Not Used
6	Data 2 -
7	Signal Common (0V) for data 1
8	Signal Common (0V) for data 1

**Table 10-2 Ethernet port pin assignment**

#### 10.1.1 Ethernet Indicators

There are two indicator lights on the Ethernet port.

The following is the meaning of these indicators:

<b>Indicator</b>	<b>Off</b>	<b>Solid</b>	<b>Flashing</b>
Yellow	No Ethernet connection	Ethernet port connected	Active communication
Green	Speed set to 10Mb/s	Speed set to 100Mb/s	n/a

**Table 10-3 Ethernet port indicator meaning**



# Installation Instructions

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## 10.2 USB Port

The USB port on the phase selector is a standard mini-A receptacle. To communicate with the phase selector using USB, connect a USB cable from the USB port on the phase selector to a USB port on your computer.

- The first time you connect your computer to the phase selector using the USB port, your computer will detect a new device called Opticom phase selector.
  - Follow the prompts to install the driver
  - See the On-site help file for additional detail.
  - Once complete, a new serial port will be created on your computer.
- Select that port number in the On-site software to communicate with the phase selector.
  - See the On-site software help file for details.
- When you disconnect the USB cable, your computer will no longer see that serial port.
  - But it will reappear when you reconnect the cable.
  - If you plug into a different USB port on your computer, it may install another serial port.

Pin	Function
1	VCC (+ 5 VDC)
2	Data -
3	Data +
4	ID
5	Ground

**Table 10-4 USB port (mini-A) pin assignments**

## 10.3 RS-232 Communication Ports

- There are four RS-232 communication ports.
- Two of these ports are on the phase selector.
  - COM 1 is on the front panel (uses an industry-standard DB-9 connector)
  - COM 2 is on the rear card edge
- There are two additional RS-232 ports available on the model 768 Auxiliary Interface Panel.
  - COM 3
  - COM 4
  - These ports uses an industry-standard DB-9 connector
  - These ports may require a null modem adapter
- Some of these ports have adjustable baud rates and protocol. These settings are adjusted using the On-site software.
  - The protocol and baud rate for COM1 are fixed at 115,200 SCOM (Serial Communications)

## Installation Instructions

---

Front Panel COM 1	
COM Port Pin Number	Signal Name
1	DTR (Data Terminal Ready)
2	TXD (transmit data)
3	RXD (receive data)
4	DCD (Data Carrier Detect)
5	GND (ground)
6	DTR (Data Terminal Ready)
7	CTS (Clear to Send)
8	RTS (Ready to Send)
9	RI (ring Indicator)
Rear Edge COM 2	
COM Port Pin Number	Signal Name
19	TXD (transmit data)
21	RXD (receive data)

**Table 10-5 Communication Port Pin Assignments (Phase Selector)**

# Installation Instructions

## 10.3.1 RS-232 COM Port on the Rear Edge Connector

When shipped from the factory, the rear edge RS-232 communication port is not enabled.

To enable the rear edge communication port, remove the two jumpers from their storage positions in positions 2 and 4 on JP4 and place one jumper across pins 1 and 2 and one jumper across 3 and 4 on JP4. See Figure 10-1.

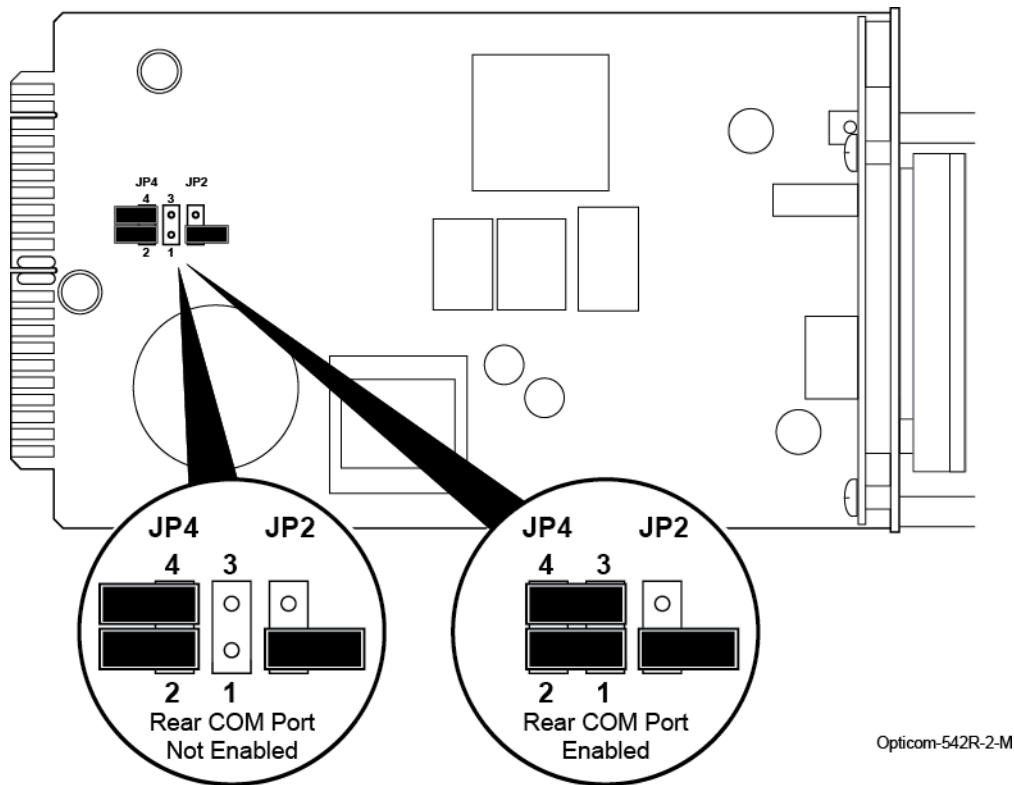


Figure 10-1 Enable Rear Edge Communication Port

## Installation Instructions

---

### 10.3.2 RS-232 COM Ports on the Auxiliary Interface Panel

There are two RS-232 COM ports on the auxiliary interface panel. These ports are labeled COM 3 and COM4. These COM ports are configured for connection to a modem so it is probable that a null modem adapter will be needed when they are used.

Auxiliary Interface Panel COM 3	
COM Port Pin Number	Signal Name
1	DCD (Data Carrier Detect)
2	RXD (receive data)
3	TXD (transmit data)
4	DTR (Data Terminal Ready)
5	GND (ground)
6	DCD (Data Carrier Detect)
7	RTS (Ready to Send)
8	CTS (Clear to Send)
9	RI (ring Indicator)

Auxiliary Interface Panel COM 4	
COM Port Pin Number	Signal Name
1	Not used
2	RXD (receive data)
3	TXD (transmit data)
4	Not used
5	GND (ground)
6	Not used
7	Not used
8	Not used
9	Not used

**Table 10-6 Communication Port Pin Assignments (Auxiliary Interface Panel)**

# Installation Instructions

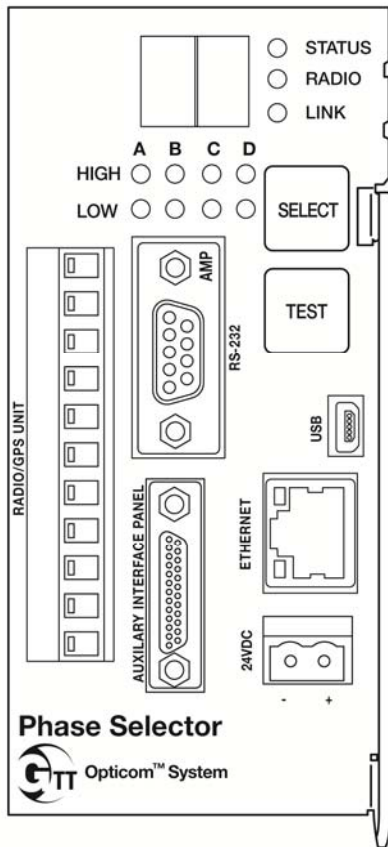
## 11 Phase Selector Indicators, Display and Switches

This section describes the indicators and switches on the front panel of the phase selector.

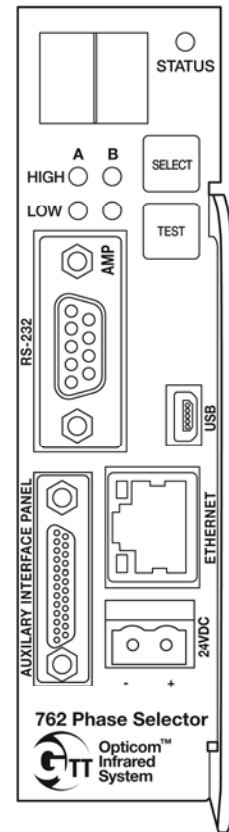
### 11.1 Indicators

The phase selector has the following indicators. See Figures 11-1, 11-2 and Table 11-1.

- Status
- Radio (764 only)
- Link (764 only)
- Channel A (high and low)
- Channel B (high and low)
- Channel C (high and low) (764 only)
- Channel D (high and low) (764 only)
- A two digit, eight segment display and a select and test switch.



Opticom-0003-1



Opticom-0001R-1

Figure 11-1 764 Phase Selector

Figure 11-2 762 Phase Selector

## Installation Instructions

Table 11-1 lists the LED indicators on the front panel of the phase selector, the color or condition of the LED, and what it means.

Indicator	Color or Condition	Meaning
STATUS	Off	Phase selector powered off or offline
	Steady Green	Phase selector powered and online
	Flashing Green	Phase selector in standby mode
RADIO (764 Only)	Off**	The RADIO indicator will always be off if the phase selector is operating in IR only mode. There is no RADIO LED on a 762
	Amber	Radio/GPS unit connected with <b>no</b> GPS lock
	Green	Radio/GPS unit connected <b>with</b> GPS lock
LINK (764 Only)	Off	The LINK indicator will always be off if the phase selector is operating in IR only mode. There is no LINK LED on a 762
	Green	Actively communicating with another radio
A	High*	High priority call on channel A
	Low*	Low priority call on channel A
B	High*	High priority call on channel B
	Low*	Low priority call on channel B
C (764 only)	High*	High priority call on channel C
	Low*	Low priority call on channel C
D (764 only)	High*	High priority call on channel D
	Low*	Low priority call on channel D
A, B, C, D	All on steady amber	Phase selector in broken mode, contact tech support
<p>* Flashing indicator means the call is present, but the output is not active.</p> <p>** The radio light will flash amber for 30 seconds after the phase goes online while it searches for a radio/GPS unit. It will shut off if one is not found.</p>		

**Table 11-1 Phase Selector Indicators**

# Installation Instructions

## 11.2 Display and Switches

Phase Selectors have a two digit display and two switches.

- Select Switch
- Test Initiate Switch

The Select switch is designed to act in conjunction with the test switch to provide different operations and tests. The operation/test to be performed is displayed in the 2 digit display. Each time the select switch is pressed the next operation/test is displayed. The list will repeat after the last available operation/test is displayed.

The display is normally off. While it is off, the test switch will have no function. If no buttons are pressed for 5 seconds, the display will shut off.

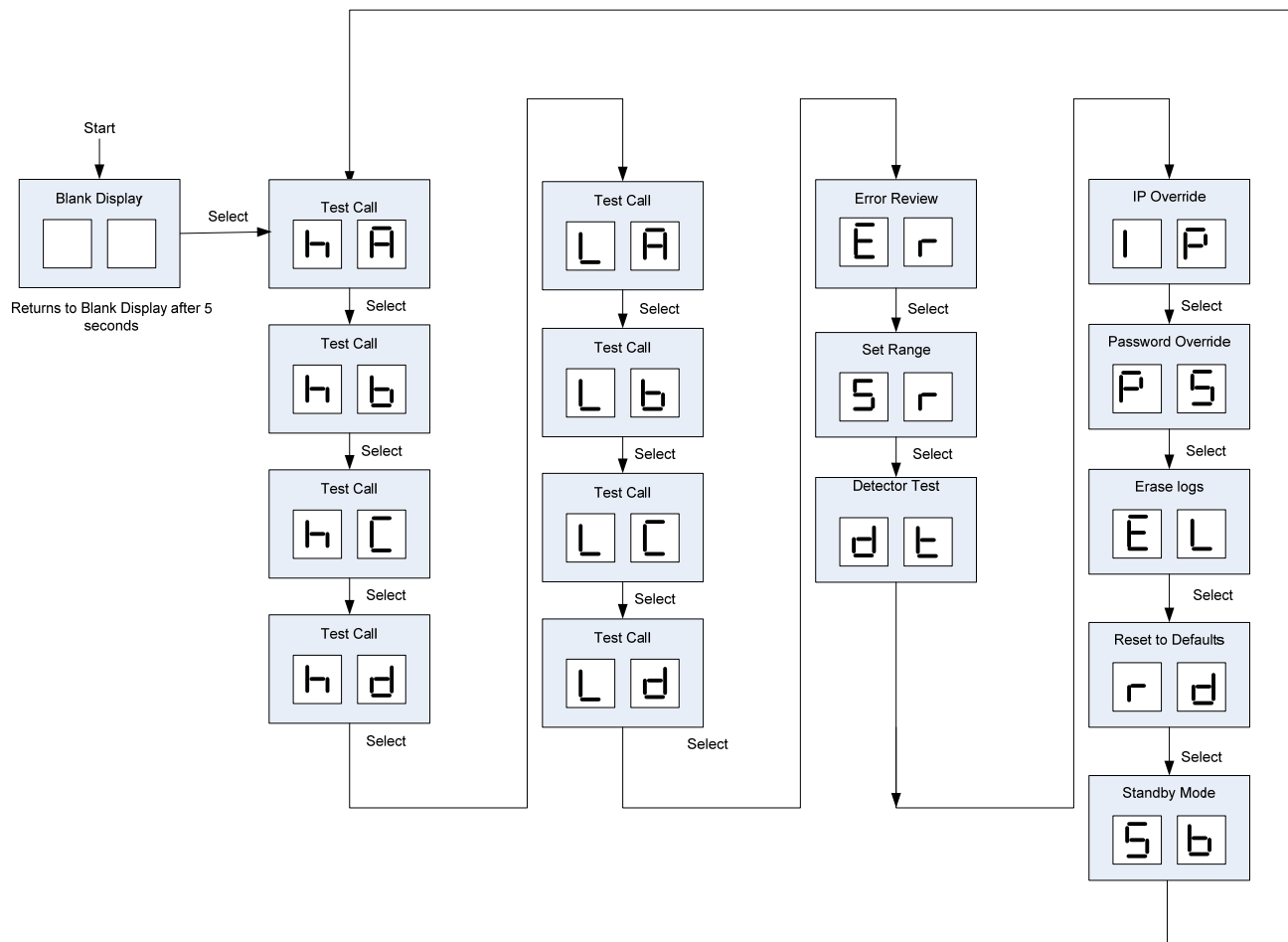


Figure 11-1 Phase Selector Select Switch Functions

## Installation Instructions

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### 11.2.1 Manual Test Calls

These settings will place manual test calls. If the phase selector outputs are connected to the controller's preemption/TSP inputs, a live call will be placed to the controller. It is recommended that the controller's preemption and TSP routines be programmed prior to placing manual test calls.

- **hA, hb, hC and hd**, Places a high priority call on the corresponding channel.
  - e.g. hC places a high priority call on channel C.
  - 762 does not have channels C and D.
- Press the SELECT button until the desired channel and priority is displayed.
- Press the TEST button.
  - The display will flash and the corresponding HIGH LED will illuminate solid.
  - The call will continue for five seconds.
    - Each additional push of the test button while the LED is illuminated will extend the call by an additional five seconds.
  - If the LED does not illuminate, that indicates that channel/priority is inactive.
  
- **LA, Lb, LC and Ld** places a low priority call on the corresponding channel.
  - e.g. Lb places a low priority call on channel B.
  - 762 does not have channels C and D.
- Press the SELECT button until the desired channel and priority is displayed.
- Press the TEST button.
  - The display will flash and the corresponding LOW LED will illuminate solid.
  - The call will continue for five seconds.
    - Each additional push of the test button while the LED is illuminated will extend the call by an additional five seconds.
  - If the LED does not illuminate, that indicates that channel/priority is inactive.



# Installation Instructions

## 11.2.2 Error Listing

Er displays a list of active errors, if any

- Press the SELECT button to display Er.
- Press the TEST button to display any active errors in the system.
- Press the SELECT to display the next error code.
- Continue to press the SELECT button until all active errors have been displayed.
  - When the last error is displayed, pressing Select re-displays the first error code.
- Pressing TEST exits to the main menu.

Error Code	Definition	Error Code	Definition
--	No Errors	EE	24V
E1	Data Bus Error	EF	Future use
E2	Address Bus Error	EG	GPS
E3	Internal RAM Error	Eh	Radio Module
E4	External RAM Error	EI	Future use
E5	External Flash Error	EJ	Future use
E6	Data Flash/File System	Ek	Future use
E7	RTC	EL	Future use
E8	Unknown Identity	En	Future use
E9	Invalid Application	Eo	Future use
EA	No Application	EP	Future use
Eb	Switch hardware	Eq	Future use
EC	Display Hardware	Et	Future use
Ed	Watchdog Reset	EU	Future use

Table 11-2 Error Code Listing

## 11.2.3 Set Range

Sr Resets the range setting timeout. This will allow the phase selector to respond to a range setting code transmitted by a range setting IR emitter. After the time out period, the range code has no effect on operation of the phase selector. This feature ensures that setting range via an emitter is available only to authorized personnel who have access to the traffic cabinet.

### Reset the Range Setting Timeout:

- With no emitters present, press the SELECT button until Sr is displayed.
- Hold the TEST button for 5 seconds.
- Sr will flash when the reset has occurred.

Sr is also used to set range with a non-range setting emitter.

### Set the range:

- Place an IR emitter equipped vehicle at the point where you want detection to begin.
- Press the SELECT button until Sr is displayed.
- Hold the TEST switch until the Sr flashes and the corresponding call LED lights.
- A new range value will be applied to all classes on this channel.
  - **This will set range only for the current profile/time plan.**
  - **This function only applies to Infrared operation.**

## 11.2.4 Detector Function Test

**dt** Verifies that an infrared detector is connected to each channel.

- Press the SELECT button until dt is displayed.
- Press the TEST button for one second.
  - The HIGH LED will illuminate for each channel that has a detector(s) connected.
  - The indicator will flash for two seconds.
- **This test only confirms that a detector is connected to the channel.**
  - **See the detector noise level reading in the On-site software for a comprehensive evaluation of the health of the detector.**

## 11.2.5 IP Address Reset

**IP** Resets the IP address back to the factory default setting.

- Press the SELECT button until IP is displayed.
- Press and hold the TEST button for 5 seconds.
  - IP will flash when the reset has occurred.

## 11.2.6 Password Override

**PS** Activates password override. This is used if the password has been lost. Once the password has been shut off, the user may change the password using the On-site or CMS software.

- Press the SELECT button until PS is displayed.
- Press and hold the TEST button.
  - PS will flash when the override has occurred.
  - The password will be shut off for 1 hour or until the phase selector is reset.

## 11.2.7 Erase logs

**EL** Erases all of the logs on the phase selector. This includes call logs, diagnostic logs and call playback logs.

- Press the SELECT button until EL is displayed.
- Press and hold the TEST button for 5 seconds to erase all call logs.
  - EL will flash when the logs have been erased.

## 11.2.8 Reset All Parameters to Default

**rd** Resets all configurable parameters for the phase selector to factory default.

- Press the SELECT button until rd is displayed,
- Press and hold the TEST button for 5 seconds.
  - rd will flash when the reset has occurred.

## 11.2.9 Standby Mode

**Sb** Places the phase selector into standby mode. In this mode the phase selector remains powered on, but it will not respond to preempt requests from vehicles.

- Press the SELECT button until Sb is displayed.
- Press and hold the TEST button for 5 seconds.
  - Sb will flash and remained displayed until the phase selector returns to normal operation.

### Return to normal operation

- With Sb displayed, press the TEST button.
  - Sb will flash and then go off when you have returned to normal operation.

# Installation Instructions

## 12 Checkout

For details on how to check out and test the Opticom™ System, refer to the On-site software Help files.

## 13 Troubleshooting

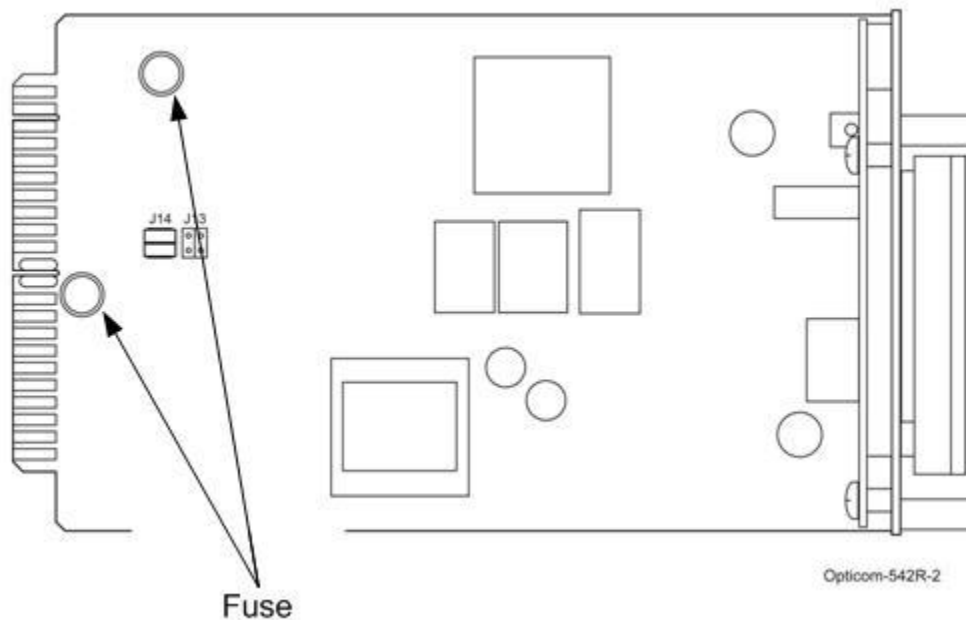
This section provides details on troubleshooting the equipment.

### 13.1 Fuse Locations

There are two fuses on the phase selector. They are approximately .25" in diameter, brown in color and removable from their sockets.

These fuses are both 1 amp. The part number of these fuses made by Littelfuse is 38211000410.

The fuse is available from Digikey, Newark and Mouser.



**Figure 13-1 Fuse Locations on the phase selector**

## Installation Instructions

### 13.2 Troubleshooting Tables

Table 13-1 shows the symptoms of intersection equipment installation and setup problems. The table also shows the possible causes of the problems and suggests solutions to correct them.

Table 13-2 shows the expected voltages at various wiring terminals

**Table 13-1 Troubleshooting Symptoms, Possible Causes, and Solutions**

Symptom	Possible Cause	Solution
Phase selector Status will not light.	Wiring incorrect.	Check wiring. Verify that the phase selector is receiving either 120 VAC or 24 VDC
	Faulty Radio/GPS unit	Disconnect and replace radio/GPS unit
	Phase selector failed.	Return unit to GTT for service.
Call LED does not light when vehicle is in an approach.	Vehicle is not in range.	Using The On-site software, check range for all classes, high and low priority.
	Vehicle is not transmitting.	Check the View Vehicles and Intersections Heard window to see if vehicle is being heard.
	Priority that vehicle is operating in, is shut-off.	Enable priority and set range.
	Radio/GPS unit failed.	Return unit to GTT for service.
	Phase selector failed.	Return unit to GTT for service.
Call LED lights but controller will not respond.	Phase selector outputs not wired correctly.	Verify that phase selector outputs are wired to correct controller preemption inputs and logic ground.
	Phase selector outputs not configured correctly.	Verify that outputs are configured correctly.
	Phase selector outputs have failed.	Verify that controller does not see preemption input, replace phase selector.
	Controller preemption inputs are inactive.	Turn inputs on.
	Controller preemption inputs have failed.	Replace controller.
Active Greens window shows all greens active continuously.	Green Sense AC neutral (AC-) not connected.	Connect green sense common (white wire) to cabinet common.

## Installation Instructions

**Table 13-1 Troubleshooting Symptoms, Possible Causes, and Solutions (continued)**

Symptom	Possible Cause	Solution
Call LED lights and controller responds, but green light not granted in time.	Phase selector timing.	Verify that there is no call delay in phase selector and controller.
	Controller not programmed correctly.	Program preemption routines to respond as quickly and safely as possible.
	Range set too short.	Increase range.
	Approach map is not long enough or is drawn incorrectly.	Redraw approach map.
	Call was placed, but then dropped. Detector is obstructed preventing constant reception.	Move detector or increase lost signal timeout.
Call LED lights, but intersection displays all red lights.	Controller preemption input is not programmed.	Program preemption inputs to display green light as quickly and safely as possible.
Call to controller will not drop.	Long call hold time or lost signal hold time programmed.	Reduce hold time.
	Vehicle is not in disable mode	Activate vehicle disable switch
	Phase selector failed.	Replace phase selector.
	Controller input failed.	Replace controller.
All channel call LEDs on steady	Phase selector in broken mode	Contact tech support
Times in log are incorrect.	Time localization not set or set incorrectly.	Set correct offset for your area.

## Installation Instructions

**Table 13-1 Troubleshooting Symptoms, Possible Causes, and Solutions (continued)**

Symptom	Possible Cause	Solution
RADIO/LINK LEDs are off	Not used in Infrared operation	n/a
Unable to communicate with phase selector.	Communication cable not connected.	Check cable connection at phase selector and at computer.
	Baud rate incorrect.	Using the On-site software, change baud rate under Environment options.
Controller locks up or displays all red when call is placed.	Controller preempt routines not programmed or programmed incorrectly.	Re-program controller preempt routines.
Controller does not cycle to correct green when call is placed.	Controller not programmed correctly.	Program controller.
	Preempt inputs not enabled.	Enable preempt inputs.
	Excess timing delays or minimum times programmed in preempt routine.	Program controller to respond to a priority request as quickly and safely as possible.
	Phase selector output wiring incorrect.	Wire phase selector outputs correctly.
	Phase selector Logic Common/Opto-Common not connected correctly.	Connect phase selector Logic Common and/or Opto-Common to controller's Logic Common.
	Phase selector outputs not assigned correctly.	Configure outputs correctly.
	Controller interface (D connector) wiring incorrect.	Wire inputs correctly.

**Table 13-2 Expected Voltages**

Location/Terminal	Expected Voltage	Notes
Black/White wires into card rack	120 VAC	
Pins A and B on card edge connector	24 VDC	To power phase selector.
24 VDC terminal on front of phase selector	Approximately 21 VDC (When power applied through card edge connector)	Check fuse. External 24 VDC attached to this terminal may also be used to power phase selector.
Card rack DC+ to DC-	Approximately 24 VDC	

### 14 Maintenance

Opticom™ System components are designed for reliable operation. Inspect the components at regular intervals to ensure proper system operation.

GTT recommends the following:

- All components should be inspected at least every twelve months.
- Verify that noise level is between 10-35 for all channels with a detector using the On-site software.
- Each intersection and vehicle system should be inspected and tested at least every twelve months to ensure that it functions to your specifications and requirements.
- Intersection systems should be tested with known good vehicle systems.
- Vehicle systems should be tested with known good intersection systems.
- You should develop a test plan that fits your department's operations and meets the needs of your system.
- You should keep accurate and up-to-date records of system performance and test results.

## Installation Instructions

### 15 Driving a Relay from a Phase Selector

It is possible to drive an electro-mechanical or solid-state relay from a phase selector output. However, this application falls outside of the intended use of the Opticom™ GPS System and the system was not designed for this application. Should you do so on your own, it is important to use a relay that falls within the parameters described below to prevent damage to the phase selector. It is recommended that you use a Model 770 Gate opener card rack which includes a relay. See Appendix C for details.

Figure 15-1 is a wiring diagram that shows how the relay is connected to the phase selector.

This section only applies when using a 760 card rack. Contact technical service if you are using a different model card rack.

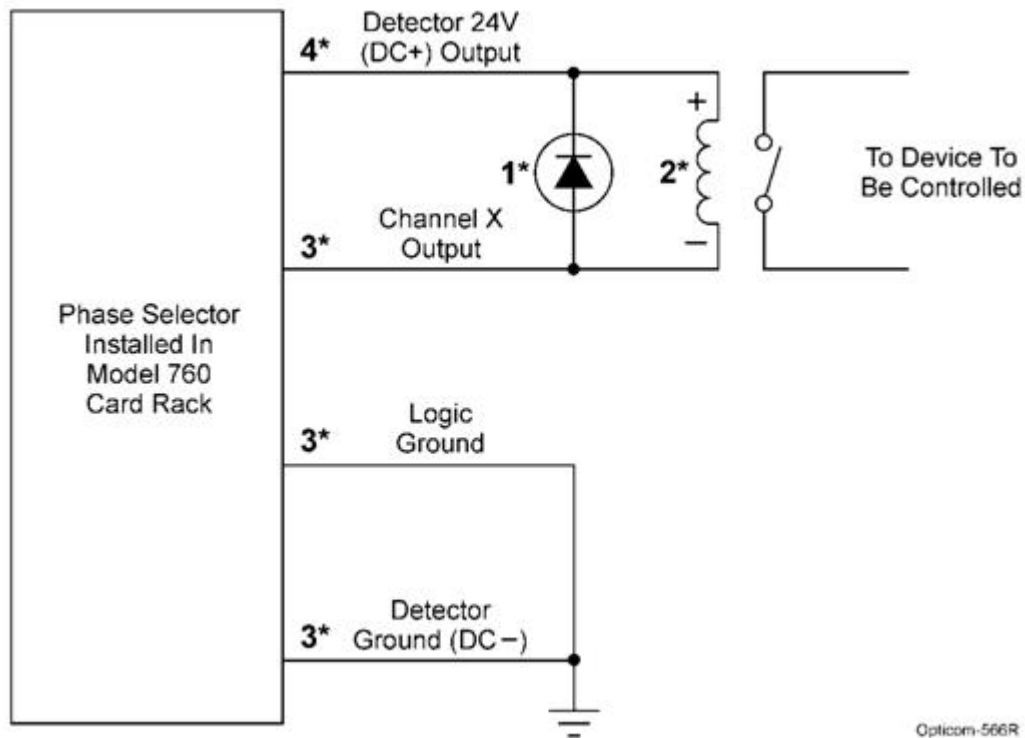


Figure 15-1 Wiring Diagram

\*Numbers 1 – 4 correspond to the numbers in the following Recommendations section.



## Installation Instructions

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### Recommendations

1. Use a 1N4004 or equivalent diode.
2. Use a 24 VDC relay with a coil impedance of approximately 1000 ohms. The maximum amount of current that the phase selector output is designed for is 50 mA.

The following relay manufactured by IDEC meets the above listed requirements:

- Relay: RH1B-UD-DC24V
- Socket: SH1B-05
- This relay contains a diode, so the diode shown in Figure 15-1 is not needed.
- This relay is available from Newark Electronics and other electronics supply houses.

### Notes:

- **For applications with frequent activations, it is recommended that a solid-state relay be used in place of an electro-mechanical relay. A load switch would be another option.**
  - **Omron G3NA-205B-DC5-24**
    - **This relay is available from Digikey [www.digikey.com](http://www.digikey.com), (p/n Z165-ND) and other electronics supply houses.**
3. The following table lists the wire colors for Channels A through D and Logic Ground when using a card rack. See Figure 15-1.

Channel X Output	Wire Color
Channel A	Gray/White
Channel B	Blue/White
Channel C	Violet/White
Channel D	Brown/White
Logic Ground	Gray/Black

**Table 15-1**

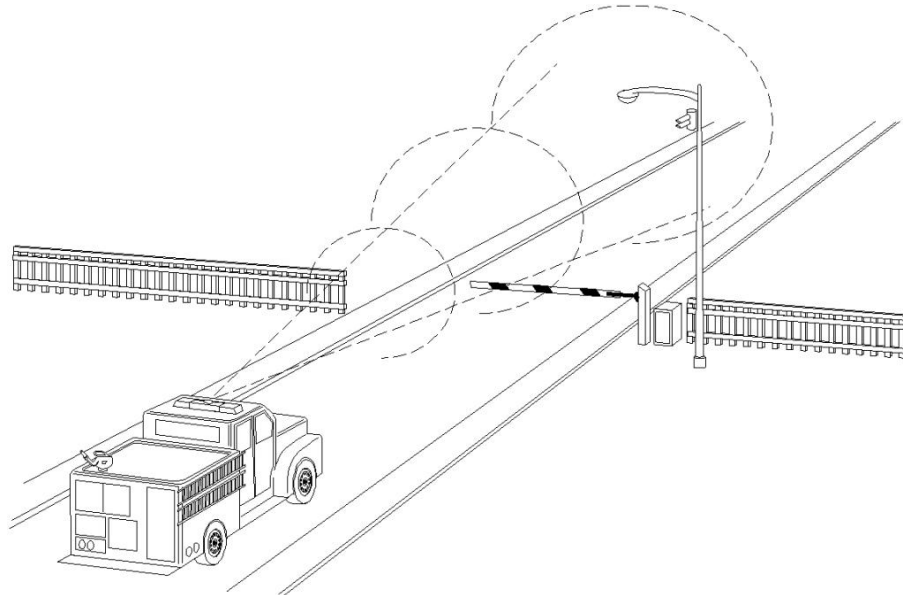
For more pin-out information, refer to the Phase Selector Pin Index tables in this manual.

4. When using a 760 card rack, phase selector 24 VDC power may be used provided the total load between relays and detectors is less than 300mA. Model 711 detectors consume 15 mA and Model 721 and 722 detectors consume 30 mA.

# Installation Instructions

## 16 Gate Opener Card Rack

The Model 770 Gate Opener Card racks are intended to allow an authorized vehicle that is equipped with Opticom vehicle equipment to open a gate. Other possible applications are to allow an authorized vehicle equipped with Opticom vehicle equipment to activate a flasher, sign, etc. The Gate Opener card racks are used in conjunction with an Opticom phase selector and Opticom IR detectors to accomplish these tasks.



**Figure 16-1**

The Model 770 Gate Opener Card Rack has the following features:

- Integrated Electro-Mechanical Relay compatible with most Gate Openers.
- Provides dry contact outputs.
- May be used in Normally Open and Normally Closed applications.
- Easy installation
- Connection points for IR detectors

Contact ratings:

Resistive

- 10A 240 VAC
- 10A 30 VDC

General Use

- 7.5 A 120 VAC
- 7.5 A 240 VAC
- 7A 30 VDC
- 1/6 hp 120 VAC
- 1/3 hp 240 VAC

### **WARNING**

Switching a load that is higher than the contact ratings may result in equipment failure which may cause improper system operation. **This device is intended to actuate the gate opening circuit only. Do not use to switch actual motor drive current.** Improper system operation may result in system/device failure leading to a delay of the emergency vehicle.

## Installation Instructions

### 16.1 Card Rack Installation

The card slot in the Model 770 Card Rack is dedicated to a phase selector. The edge connector is wired to the connector on the card rack front panel and the terminal strip which is also on the card rack front panel.

#### ⚠ WARNING

Installation of this equipment by a person who is not properly trained or skilled for installing gate opening systems may cause improper operation of the gate opener. **To avoid this problem, only persons trained in the installation of gate opening systems should install this equipment.** Improper system operation may result in system/device failure leading to a delay of the emergency vehicle.

#### ⚠ WARNING

Improper or incomplete programming of the Gate Opener may cause improper operation of the gate opener. To avoid this problem, verify that the operation of the gate opener is appropriate for your needs before, during, and after actuation of the priority control inputs. Improper system operation may result in system/device failure leading to a delay of the emergency vehicle

Rear outputs 1 and 2 from the phase selector are connected to the relay inside the card rack. The outputs of the relays are then connected to the terminal on the front of the card rack. These terminals are intended to be connected to the gate opener to activate the gate. Consult the manual for your gate opener to determine the proper connections. See Figure 16-3 for a typical mounting location of the Gate Opener card rack in a gate opener cabinet.

#### ⚠ WARNING

Failure of any part of the gate opener system may lead to a delay of the emergency vehicle. **To avoid this problem, The gate opener card rack should only be located inside of a weather tight enclosure.** Locate the gate opener card rack inside of an enclosure that will protect it from water and rain.

#### ⚠ WARNING

This procedure may expose you to AC voltage and the risk of electric shock or electrocution. **Turn off the AC mains and use accepted and recognized safety precautions to avoid exposure to the risk of electric shock or electrocution.** Electric shock may cause severe injury or death.

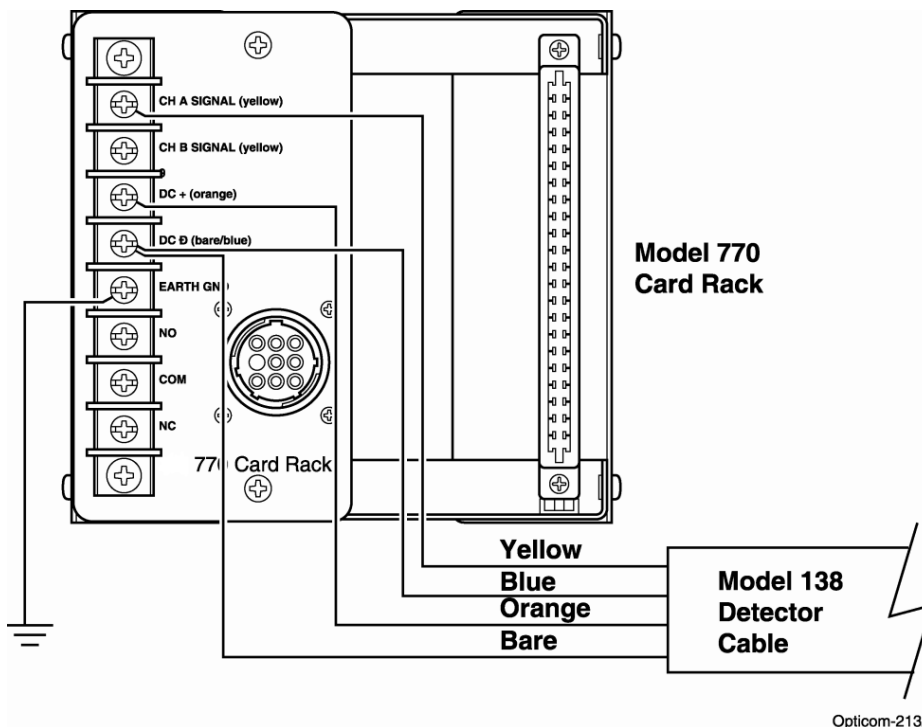
1. Place the card rack at the desired location in the gate opener controller cabinet. The card rack should be placed in a weather tight cabinet to protect it from rain, snow, etc.
2. Slide the phase selector into the slot in the card rack and press firmly to seat it into the card slot and edge connector.
3. Locate the terminals for Hot (AC+), Neutral (AC-), chassis ground, and the gate control inputs inside of your gate opener controller cabinet.
4. Place the harness connector next to the card rack and route the wires to the AC terminals.
5. Strip 1/4-inch (6 mm) of insulation from the black, white and green wires.
6. Install a spade lug on each of these three wires and connect it to the appropriate terminal. Connect the AC to points in the cabinet after the circuit breaker and any surge protection or lightning protection. See Figure 16-4 and Table 16-1.
7. Connect the harness plug to the round connector on the card rack front panel.

## Installation Instructions

8. Connect the detectors to the card rack per Figure 16-2. See the 711/721/722 detector installation instructions for details on connecting the wires inside of the detector.

Wire Color	Pin Number	Function
Black	1	115 VAC (Hot, AC+)
White	2	AC Neutral (Common, AC-)
Green	3	Chassis/earth ground

**Table 16-1 Model 770 Harness Wiring**



**Figure 16-2 IR detector connections to a 770 gate opener card rack**

**Notes:**

- When operating in GPS mode, Intersection/Gate opener equipment will not operate until setup and mapping procedures are completed. Refer to the On-site software Help files for details on how to set up and map the equipment.
- Only rear outputs 1 and 2 are connected to the relay, therefore use one of these outputs when configuring the phase selector.

# Installation Instructions

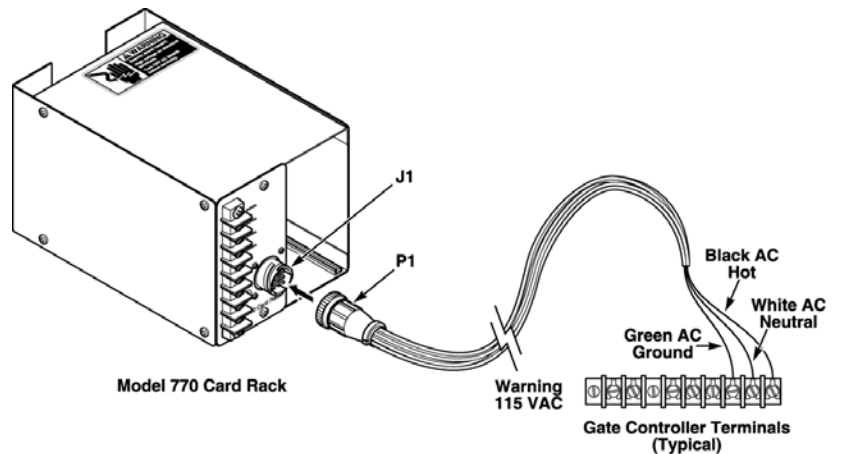
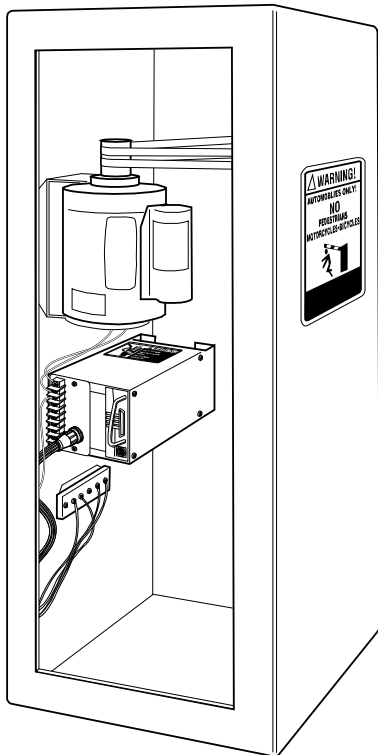
## 16.1.1 Gate Opener Relay Outputs

See above for the ratings of the relay contacts.

1. Connect a wire of sufficient gauge to handle the current draw of your gate opener between the Relay Common terminals on the Card rack to the appropriate terminal on your gate opener control.
2. Determine if your gate opener needs a normally open or a normally closed contact.
3. Connect a wire of sufficient gauge to handle the current draw of your gate opener between the Normally Open or Normally Closed terminals on the card rack to the appropriate terminal on your gate opener controller.

**⚠ WARNING**

Switching a load that is higher than the contact ratings may result in equipment failure which may cause improper system operation. **This device is intended to actuate the gate opening circuit only. Do not use to switch actual motor drive current.** Improper system operation may result in system/device failure leading to a delay of the emergency vehicle.



Oplicom-209A

Figure 16-4 Card Rack Harness Wiring

Figure 16-3 Typical Gate Opener Cabinet

### 16.1.2 Setup and Testing

1. If you are operating in GPS mode or simultaneous GPS/IR mode you will need to set-up and map the phase selector.
2. It is recommended that a GTT trained technician or a GTT dealer perform the setup and mapping.
3. See the On-site software help file for details.



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