



Global Traffic  
Technologies

**Installation Manual**

**November 2012**

Opticom<sup>™</sup> Infrared System

Model 462 Phase Selector

Model 464 Phase Selector



# Installation Instructions

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# 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.

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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.

### 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 462 and 464 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 462 phase selector is a plug-in two channel, dual priority, encoded signal device. The Model 464 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 any model Opticom detector such as 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 462 and 464 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.

This manual describes the installation of a Model 760 card rack (when required), and installation of a Model 462 and/or Model 464 phase selector into either a Model 760 card rack or a Type 170 input file.

# Installation Instructions

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## 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 8-1 for locations of pins A, B, L, M, N

Current Draw:

- When powered by 120VAC 60Hz, the Model 464 phase selector current draw is 80 mA
  - Add 15 mA for each 711 detector
  - Add 30 mA for each 721 or 722 detector
- When powered by 24 VDC, the Model 464 phase selector current draw is 110 mA
  - Add 15 mA for each 711 detector
  - Add 30 mA for each 721 or 722 detector
- When powered by 120VAC 60Hz, the Model 462 phase selector current draw is 80 mA
  - Add 15 mA for each 711 detector
  - Add 30 mA for each 721 or 722 detector
- When powered by 24 VDC, the Model 462 phase selector current draw is 110 mA
  - Add 15 mA for each 711 detector
  - Add 30 mA for each 721 or 722 detector

### 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.  
Voltage range is 115 VAC 57-63Hz.

### 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.  
Voltage range is 22-26 VDC.

### 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

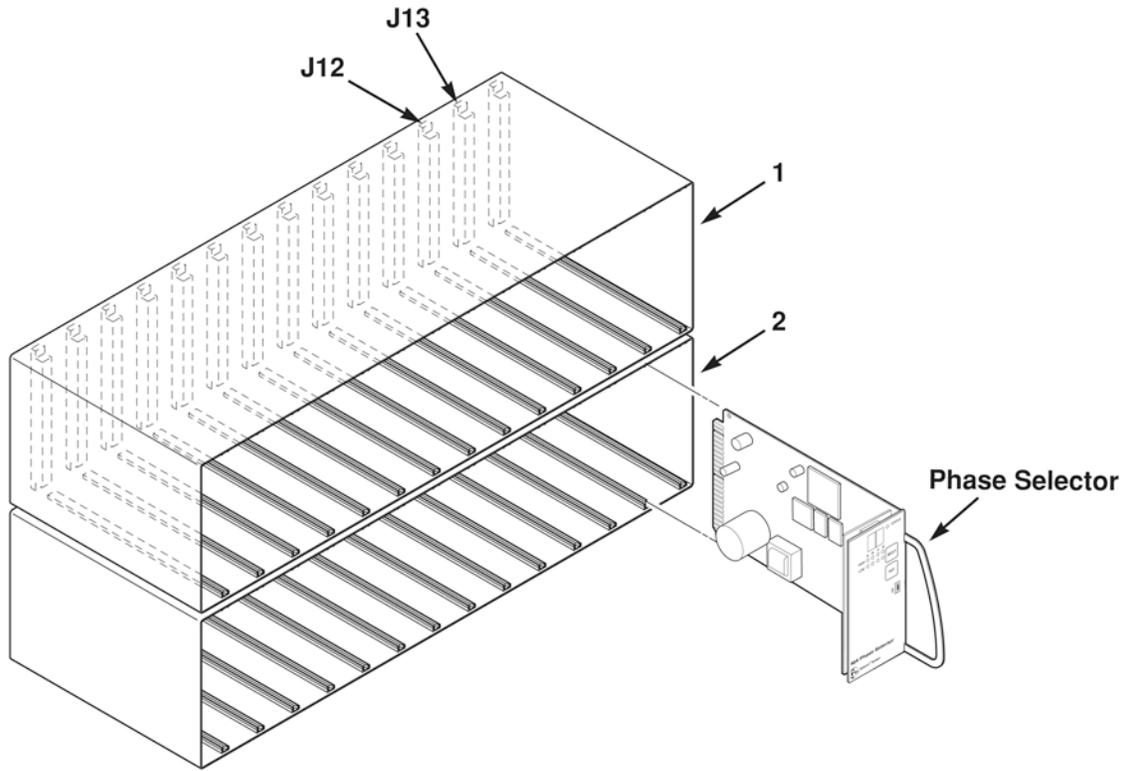
Improper or incomplete programming of the traffic controller may cause improper operation of the traffic signals, which may result in accidents and/or injuries. **To avoid this problem, verify that the operation of the traffic controller is appropriate for your needs before, during, and after actuation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

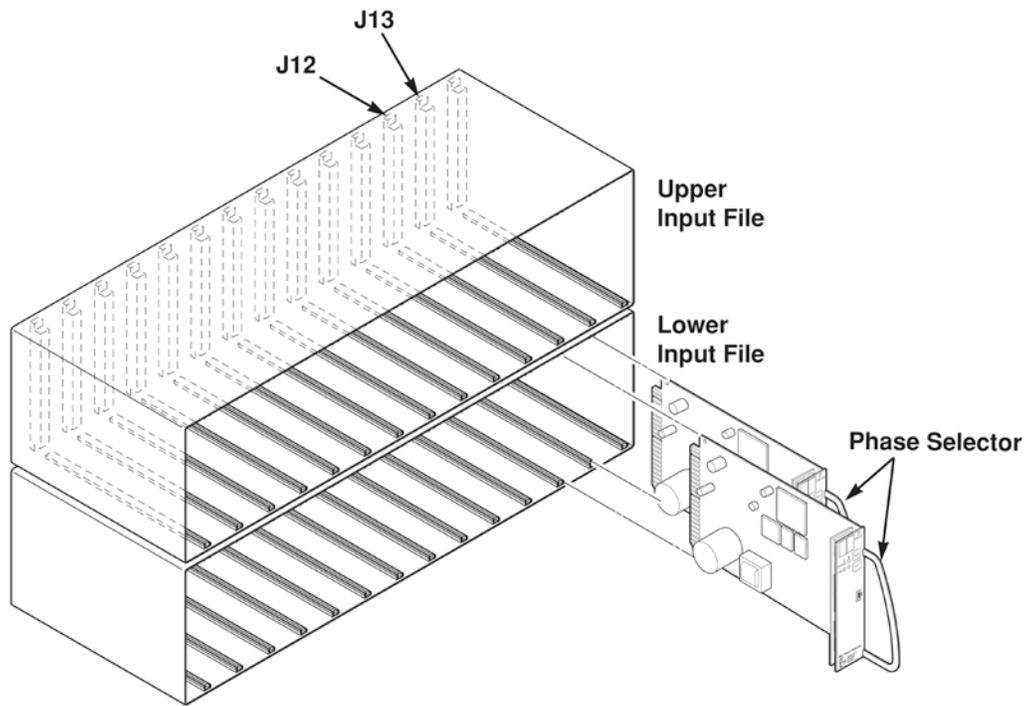
1. Install the phase selector into slot J13 of the lower input file, making sure it is fully seated. See Figure 4-1.
2. Or install two 2-channel phase selectors in slots J12 & J13, making sure that they are fully seated. See Figure 4-2.

# Installation Instructions



Opticom-464A-4

**Figure 4-1 Model 464 Phase Selector Installation Using Slot J13**



Opticom-462A-2

**Figure 4-2 Two Model 462 Phase Selector Installation Using Slots J12 & J13**

# Installation Instructions

## 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 33X/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.

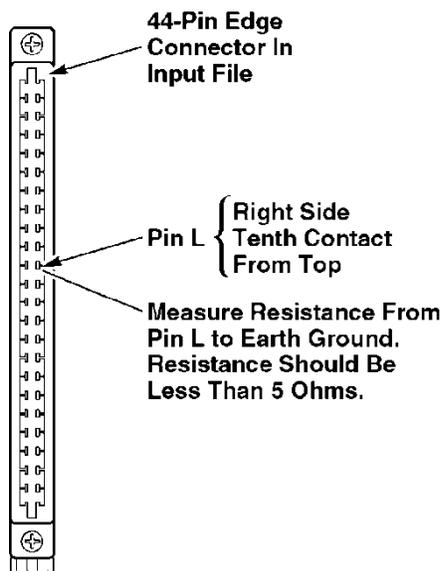
**⚠ WARNING**

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.**

1. Turn off AC power to the input file.
2. Remove the phase selector from the input file slot.
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.



Opticom-397A

Figure 4-3. Input File Continuity Test

## Installation Instructions

### 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 preemption 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.

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.

#### 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

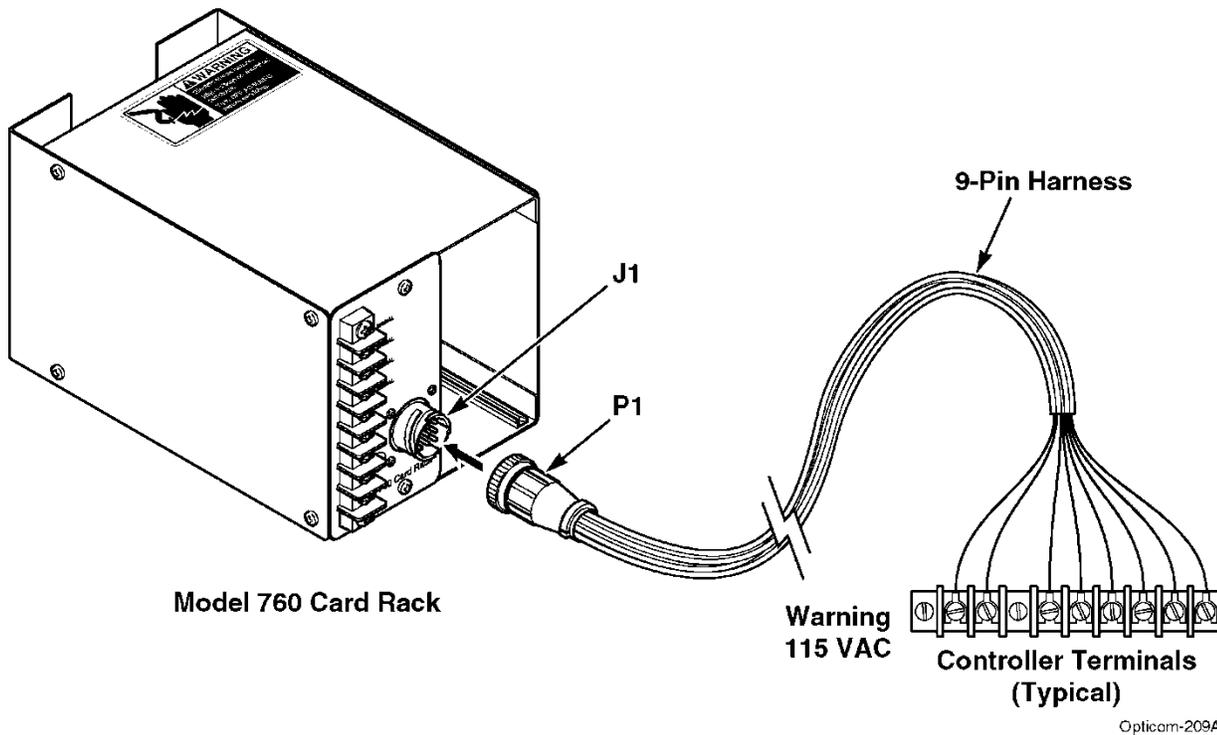
Improper or incomplete programming of the traffic controller may cause improper operation of the traffic signals, which may result in accidents and/or injuries. **To avoid this problem, verify that the operation of the traffic controller is appropriate for your needs before, during, and after actuation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

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-, and 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.

# Installation Instructions

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

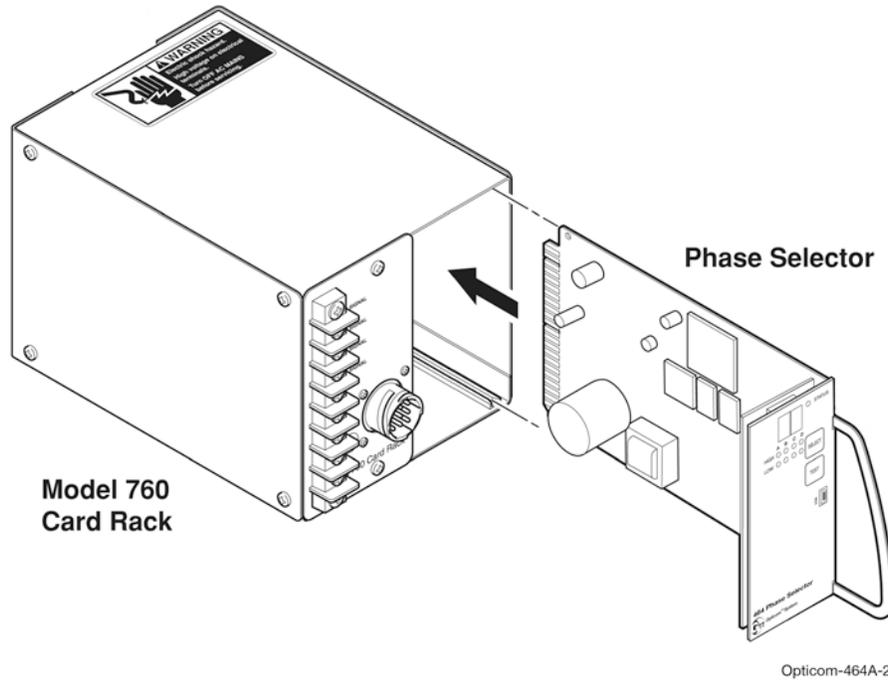
**Table 5-1 9-Pin Harness Wiring 760 card rack**



**Figure 5-1 9-Pin Harness Wiring**

# Installation Instructions

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**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 464 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 selectors, 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.

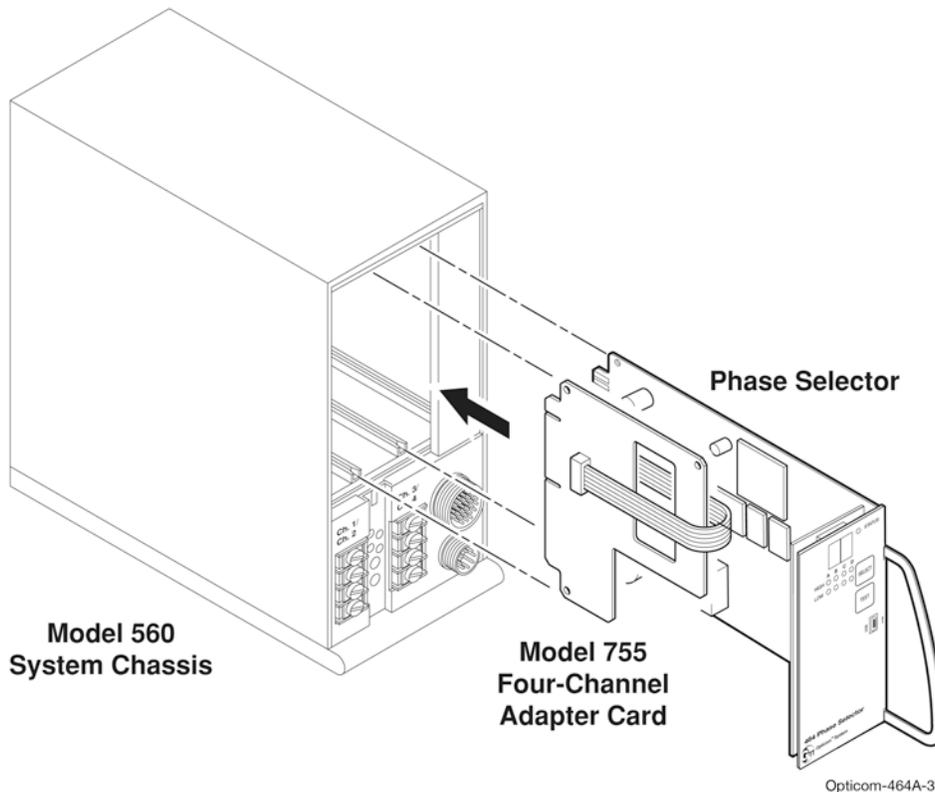


Figure 6-1 Model 755 Adapter Card

## 7 Detector Connections

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

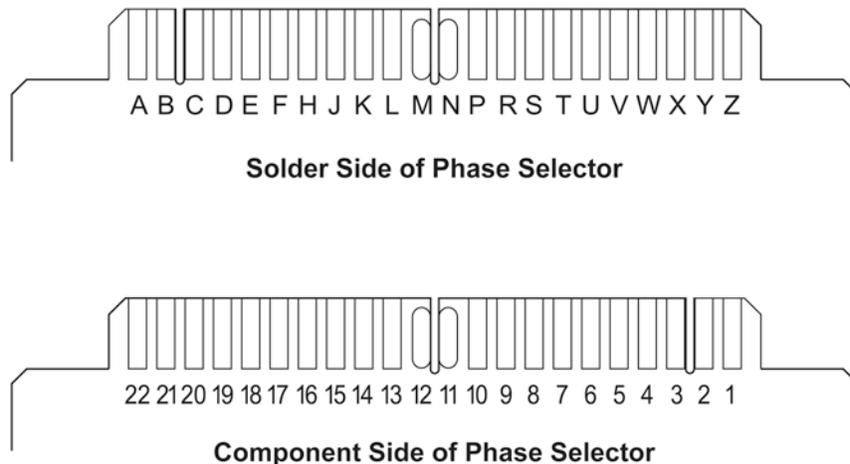
# Installation Instructions

## 8 Phase Selector Pin Index

This section is a pin index and diagram of the rear card edge connector.

Pin	Function
A	DC ground input
B	24 VDC + input
C	Not used
D	Channel A primary detector input
E	Detector 24 VDC power output
F	Channel A output, collector (+)
H	Channel A output, emitter (-)
J	Channel B primary detector input
K	Detector ground
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
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 8-1 Phase Selector Edge Connector Pin Index**



Opticom-541R-2

**Figure 8-1 Phase Selector Edge Connector Pin Letters and Numbers**

# Installation Instructions

## 9 Communication Ports and the Opticom™ On-site Software

You may communicate with a Model 462 or 464 phase selector with the On-site software. V3.0 or later of the On-site software is required. With On-site you will be able to upload logs, set the clock and update firmware. In addition you will be able to read device information such as serial number and firmware version. See the On-site help file for more details.

### 9.1 USB Port

The USB port on the phase selector is a standard mini-A receptacle. To communicate with the phase selector, 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 an 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.
  - The port will reappear when you reconnect the cable.
  - If you plug into a different USB port on your computer, it may install another serial port.

### 9.2 RS-232 Communication Port

There is one RS-232 port accessible on the rear card edge connector. See Table 9-1 for the pin out. 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 9-1.

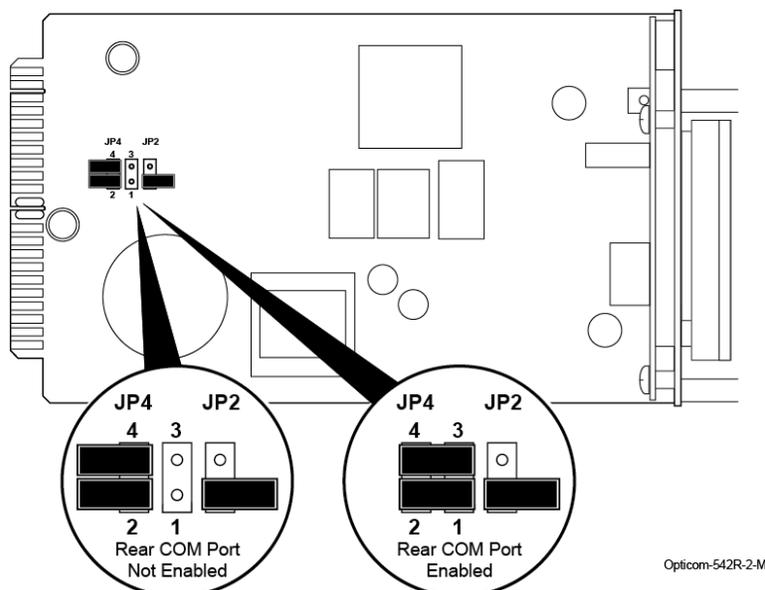


Figure 9-1 Enable Rear Edge Communication Port

# Installation Instructions

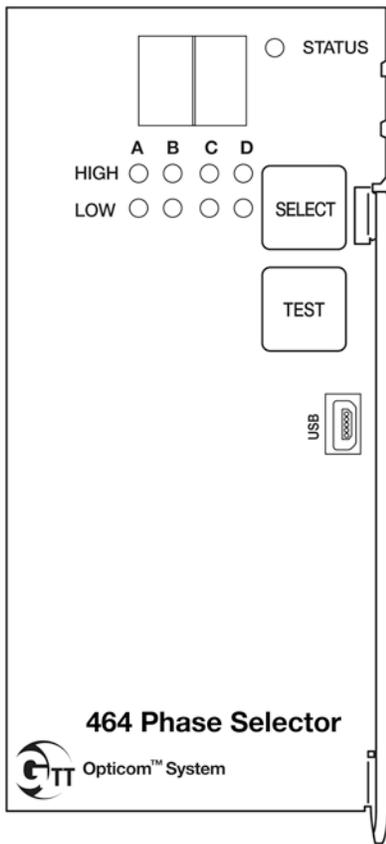
## 10 Phase Selector Indicators, Display and Switches

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

### 10.1 Indicators

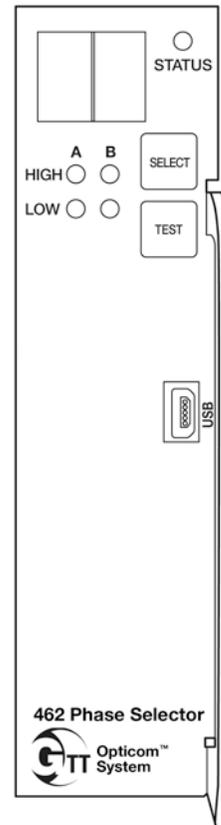
The phase selector has the following indicators. See Figures 10-1, 10-2 and Table 10-1.

- Status
- Channel A (high and low)
- Channel B (high and low)
- Channel C (high and low) (464 only)
- Channel D (high and low) (464 only)
- A two digit, eight segment display and a select and test switch.



Opticom-464A-1

Figure 10-1 Model 464 Phase Selector



Opticom-462A-1

Figure 10-2 Model 462 Phase Selector

## Installation Instructions

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Table 10-1 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
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 (464 only)	High*	High priority call on channel C
	Low*	Low priority call on channel C
D (464 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
* Flashing indicator means the call is present, but the output is not active.		

**Table 10-1 Phase Selector Indicators**

# Installation Instructions

## 10.2 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.

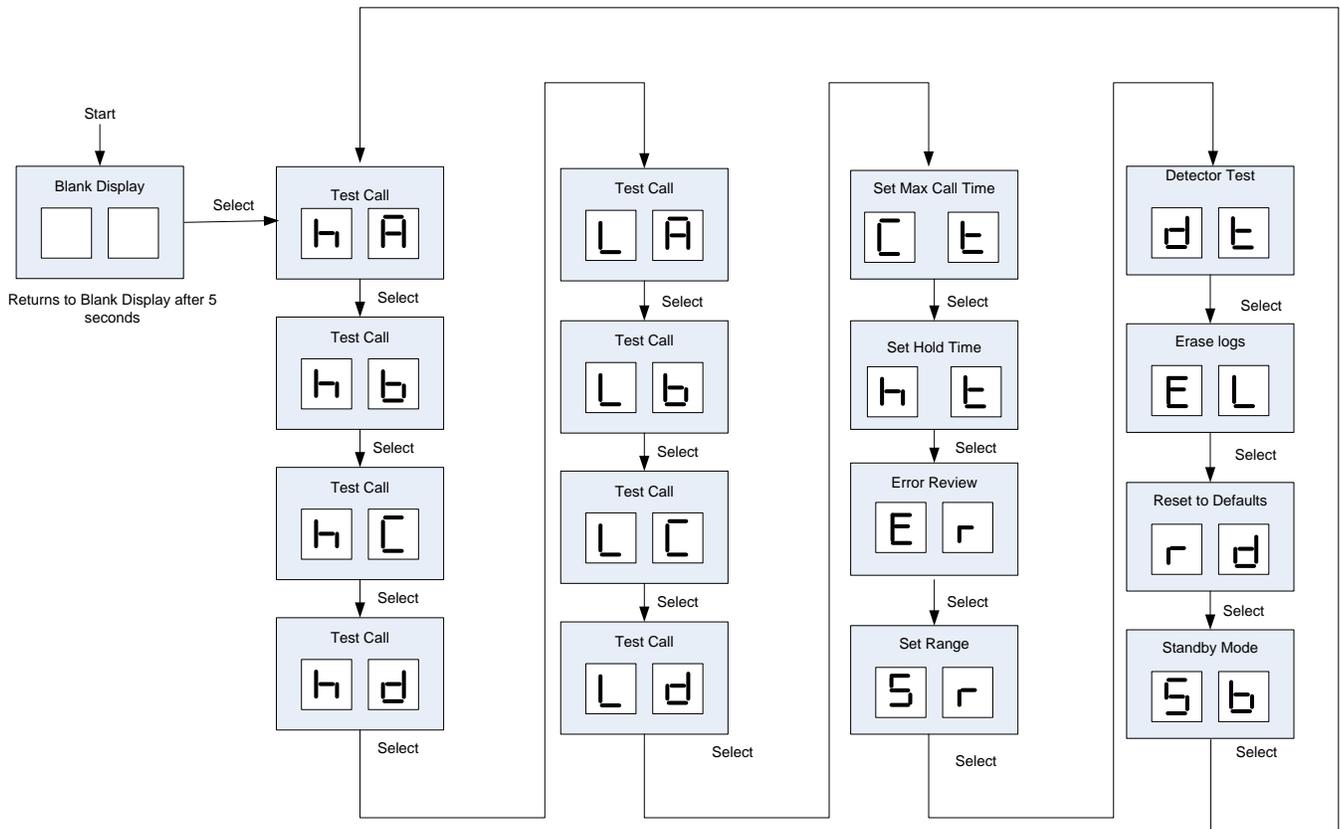


Figure 10-2 Phase Selector Select Switch Functions

# Installation Instructions

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## 10.2.1 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.
  - The 462 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.
  - The 462 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.

## 10.2.2 Set Max Call Time

This setting will allow you to set the Max Call Timer. This setting specifies the maximum time (in seconds) that an individual call is allowed to be continuously held active. After the time expires, the call will be considered "overruled" and the front panel will indicate this by flashing the call's corresponding LED and by deactivating the corresponding output as long as this vehicle ID is detected. Other vehicles approaching the intersection from the same direction (with different vehicle IDs) can still place calls on the channel.

- **Ct** Set Max Call Time
  - Press the SELECT button until **Ct** is displayed.
  - Press the TEST button to display the current setting.
    - **1**= 120 seconds
    - **2**= 180 seconds
    - **3**= 360 seconds(default)
    - **4**= 720 seconds
  - Press the SELECT button until the desired setting is displayed.
  - Press and hold the TEST button for 5 seconds until the number flashes.
  - The new value is now set.

# Installation Instructions

## 10.2.3 Set Hold Time

This setting will allow you to set the Hold Timer. This setting specifies the amount of time (in seconds) that an individual call will continue to be placed after the phase selector no longer detects the vehicle. This time will apply if the vehicle equipment is shut off, if an obstruction has blocked infrared reception or when the vehicle drives past the detector.

- **ht** Set Hold Time
  - Press the SELECT button until **ht** is displayed.
  - Press the TEST button to display the current setting.
    - **1**= 6 seconds (default)
    - **2**= 12 seconds
  - Press the SELECT button until the desired setting is displayed.
  - Press and hold the TEST button for 5 seconds until the number flashes.
  - The new value is now set.

## 10.2.4 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	Future use
E3	Internal RAM Error	Eh	Future Use
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 10-2 Error Code Listing

## Installation Instructions

---

### 10.2.5 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.

### 10.2.6 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.**

### 10.2.7 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.

### 10.2.8 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.

### 10.2.9 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.

## 11 Checkout

Although in most applications your phase selector will be fully operational right out of the box, GTT recommends that additional set up and verification be performed. Use the On-site software as well as the test switches on the phase selector to verify that all connections are correct. These steps will also determine that your detectors have been located correctly. See the On-site help file for more details.

Contact your local dealer or your local GTT representative to find out more about the set up and verification services as well as the training services that are available.

1. Check all wiring connections for accuracy.
2. If the Model 760 card rack is used, ensure that controller AC power is present.
3. Install the Model 462 or 464 phase selector into the card slot.

The Status LED should be on steady once the phase selector is booted up. If all the LEDs remain on, refer to the troubleshooting instructions in Section 12.

4. Start the On-site software
  - a) Connect the USB cable
  - b) Select the correct COM port
  - c) Press Read Device.
5. When the read is complete:
  - a) Open the Current Activity window by pressing the current activity button.
6. Look at the noise level for each channel.
  - a) Each channel that has a detector connected should display a noise level varying between 10-35.
7. Place a test calls to the controller.
  - a) To place a test call to the controller, see section 10.2.1
  - b) If the controller does not recognize the call, verify the wiring between the system and the controller. If the wiring is correct, verify the controller is programmed correctly for priority control.
8. Repeat steps 7a and 7b for all channels.
9. Drive each approach with a known good emitter-equipped vehicle.
10. Monitor the test with the Call Activity window.
11. Move or reposition detectors as needed in order to adequately detect approaching vehicles.
12. Proceed to the next section for setting the range activation point if needed.

# Installation Instructions

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## 12 Range Setting (Signal Intensity Threshold Level Adjustment)

This section includes the instructions for setting the signal intensity threshold level (range). Two procedures are described to account for the different capabilities of the various emitters. Any Opticom™ Infrared System Model 196 Emitter or higher may be used for the signal intensity threshold level setting process.

The procedures use range and timing charts in conjunction with instructions. The range and timing charts show the relationship between the speed of the priority vehicle and the worst case timing of the traffic controller. The charts also give the resultant distance, or range, required to allow adequate time for activation of the system before the priority vehicle reaches the intersection.

Section 12.1.1 describes the steps used to adjust the signal levels when the automated signal intensity threshold level setting feature of the Model 592 or newer emitter is used.

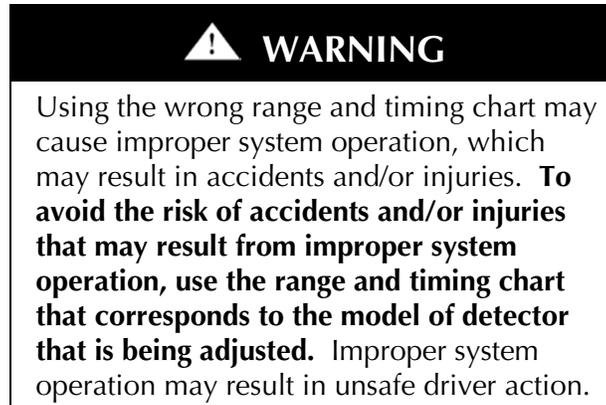
Section 12.2.2 describes the steps used to adjust the signal levels when either an emitter is used that does not have the automated signal intensity threshold level setting feature; or an emitter is used that has the feature, but the feature is not enabled.

### 12.1.1 Adjusting Range with Automated Range Setting Feature

The automated range setting feature allows this range setting task to be performed by one person.

#### Note:

- **When the automated range setting feature is used, the signal levels must be adjusted within the first 12 minutes after power is applied to the Model 462 or 464 phase selector.**
- **See Section 10.2.5 for details on resetting the range setting timeout.**



1. Locate a vehicle equipped with a range setting emitter at the desired distance from the Model 711, 721, or 722 detector at the intersection.
2. Verify that the emitter is operating properly in the low or high priority.
3. Wait for the traffic signal to turn yellow, then turn on the emitter.
4. Press and hold the range setting switch for 15 seconds.
5. Release the range setting switch.
6. Verify that the intersection range is set properly by turning on the emitter during a yellow indication. The signal light should cycle to green in a timely manner.
7. If the light does not cycle to green, begin appropriate systematic troubleshooting procedures to correct the malfunction.

# Installation Instructions

## Range and Timing Chart for Model 500/700 Series Detectors

Timing (seconds)	Vehicle Speed (mph)													
	5	10	15	20	25	30	35	40	45	50	55	60	65	70
4	50	110	170	240	310	390	470	560	650	760	860	970	1090	1210
6	70	140	210	290	380	470	570	680	790	900	1020	1150	1280	1420
8	80	170	260	350	460	560	680	790	920	1050	1180	1330	1470	1620
10	90	190	300	410	530	650	780	910	1050	1200	1350	1500	1660	1830
12	110	220	340	470	600	740	880	1030	1180	1340	1510	1680	1850	2030
14	120	250	390	530	680	830	980	1150	1310	1490	1670	1850	2040	2240
16	140	280	430	590	750	910	1090	1260	1450	1640	1830	2030	2230	2450
18	150	310	480	650	820	1000	1190	1380	1580	1780	1990	2210	2430	2650
20	170	340	520	710	900	1090	1290	1500	1710	1930	2150	2380	2620	2860
22	180	370	560	760	970	1180	1390	1620	1840	2080	2310	2560	2810	3060
24	200	400	610	820	1040	1270	1500	1730	1970	2220	2470	2730	3000	3270
26	210	430	650	880	1120	1350	1600	1850	2110	2370	2640	2910	3190	3470
28	230	460	700	940	1190	1440	1700	1970	2240	2520	2800	3090	3380	3680
30	240	490	740	1000	1260	1530	1810	2090	2370	2660	2960	3260	3570	3880
32	260	520	780	1060	1340	1620	1910	2200	2500	2810	3120	3440	3760	4090
34	270	550	830	1120	1410	1710	2010	2320	2630	2960	3280	3610	3950	4290
36	290	580	870	1170	1480	1790	2110	2440	2770	3100	3440	3790	4140	4500
38	300	610	920	1230	1560	1880	2220	2550	2900	3250	3600	3970	4330	4700
40	310	630	960	1290	1630	1970	2320	2670	3030	3400	3770	4140	4520	4910
42	330	660	1000	1350	1700	2060	2420	2790	3160	3540	3930	4320	4710	5110
44	340	690	1050	1410	1780	2150	2520	2910	3290	3690	4090	4490	4900	5320
46	360	720	1090	1470	1850	2230	2630	3020	3430	3840	4250	4670	5090	5530
48	370	750	1140	1530	1920	2320	2730	3140	3560	3980	4410	4850	5290	5730
50	390	780	1180	1590	2000	2410	2830	3260	3690	4130	4570	5020	5480	5940

2500 feet of range may be obtained with Opticom™ Infrared System Model 500/700 Series Detectors with the adjustment set to maximum.

The shaded area of the chart represents distances where an auxiliary detector can be used. Values underlined in the chart represent distances beyond the maximum range possible using auxiliary detectors.

3500 feet is the maximum total range possible using one or two Model 500/700 series auxiliary detectors 1000 feet ahead of the intersection with their range set at the maximum permitted 2500 feet.

## Installation Instructions

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### 12.1.2 Adjusting Range without Automated Range Setting Feature

This range setting task requires two people: one person in the priority vehicle equipped with a Model 196 emitter or higher, and another person at the traffic control cabinet.



#### Warning

Using the wrong range and timing chart may cause improper system operation, which may result in accidents and/or injuries. **To avoid the risk of accidents and/or injuries that may result from improper system operation, use the range and timing chart that corresponds to the model of detector that is being adjusted.** Improper system operation may result in unsafe driver action.

1. Locate the emitter-equipped vehicle at the desired distance from the Model 711, 721, or 722 detector at the intersection.
2. Turn on the emitter (select either high or low priority).
3. At the phase selector, Press the SELECT button until **Sr** is displayed.
4. Hold the TEST switch until the **Sr** flashes and the corresponding call LED lights.
5. A new range value will be applied.
6. Turn off the emitter.
7. Verify that the intersection range is set properly by turning on the emitter during a yellow indication. The signal light should cycle to green in a timely manner.
8. If the light does not cycle to green, begin appropriate systematic troubleshooting procedures to correct the malfunction.

# Installation Instructions

## 13 Troubleshooting

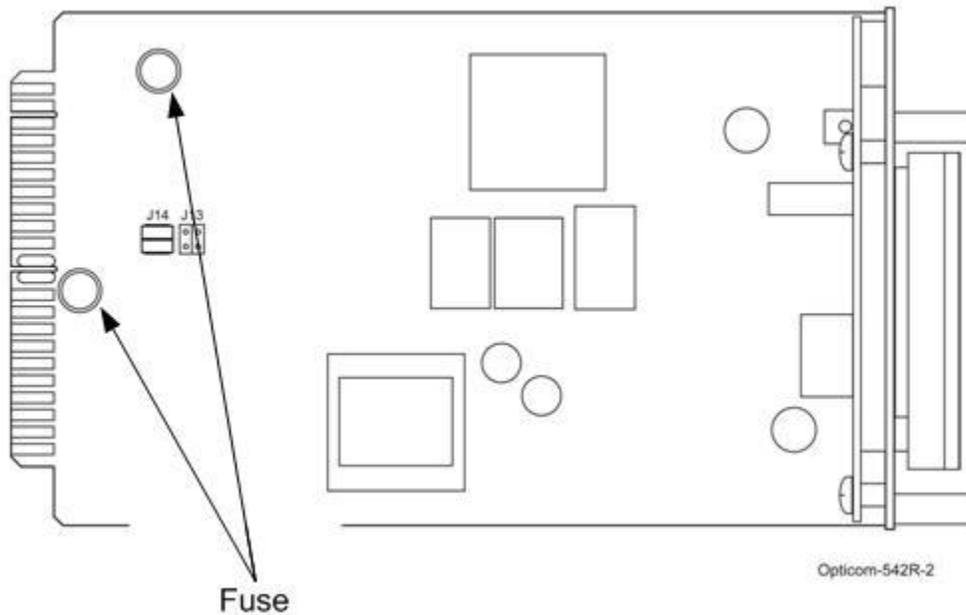
This section provides details on troubleshooting the equipment.

### 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

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### 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.
	Phase selector failed.	Return unit to GTT for service.
	Faulty IR Detector	Disconnect and replace detector/s
Call LED does not light when vehicle is in an approach.	Vehicle is not in range.	Reset the range
	Priority that vehicle is operating in is shut-off. Low priority is shut off by default.	Set the range for low priority.
	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 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.

## 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.	Controller not programmed correctly.	Verify that there is no call delay in controller.
	Controller not programmed correctly.	Program preemption routines to respond as quickly and safely as possible.
	Range set too short.	Increase range.
	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 programmed.	Reduce hold time.
	Vehicle is not in disable mode	Activate vehicle disable switch.
	Phase selector failed.	Replace phase selector.
	Rear COM port enabled	See section 9.2
	Controller input failed.	Replace controller.
All channel call LEDs on steady	Phase selector in broken mode	Contact tech support

## Installation Instructions

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

Symptom	Possible Cause	Solution
Unable to communicate with phase selector.	Communication cable not connected.	Check cable connection at phase selector and at computer.
	Wrong COM port selected.	Determine which COM port is created by USB and select that port.
	USB lost connection	Remove USB cable and reinsert, or Stop and restart On-site, or Reboot computer.
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 not connected correctly.	Connect phase selector Logic Common to controller's Logic Common.
	Phase selector outputs not assigned correctly.	Configure outputs correctly.
	Controller interface (D connector) wiring incorrect.	Wire inputs correctly.
LEDs continue to cycle through power-up sequence	24VDC is shorted	Check detector wiring for short circuit

**Table 13-2 Expected Voltages**

Location/Terminal	Expected Voltage	Notes
Black/White wires into card rack Or from cabinet card rack/input file	120 VAC	Applied to pins M and N on the phase selector.
Pins A and B on card edge connector	24 VDC	Applied to pins A and B on the phase selector.

### 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™ 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 section 15.

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.

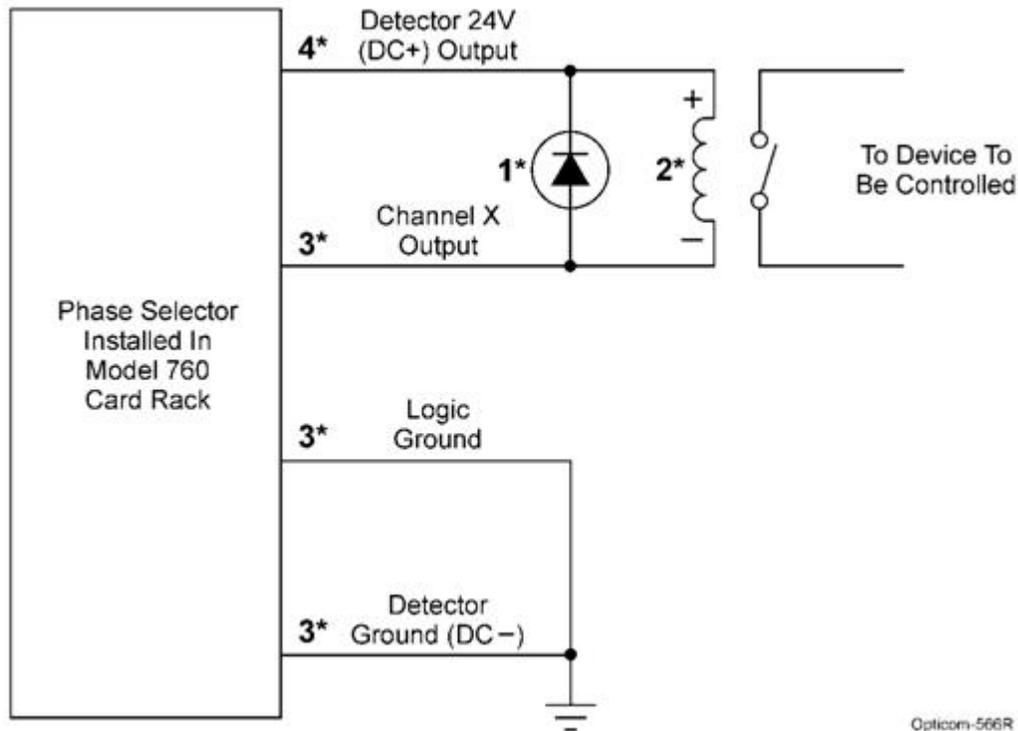


Figure 15-1 Wiring Diagram

\*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.

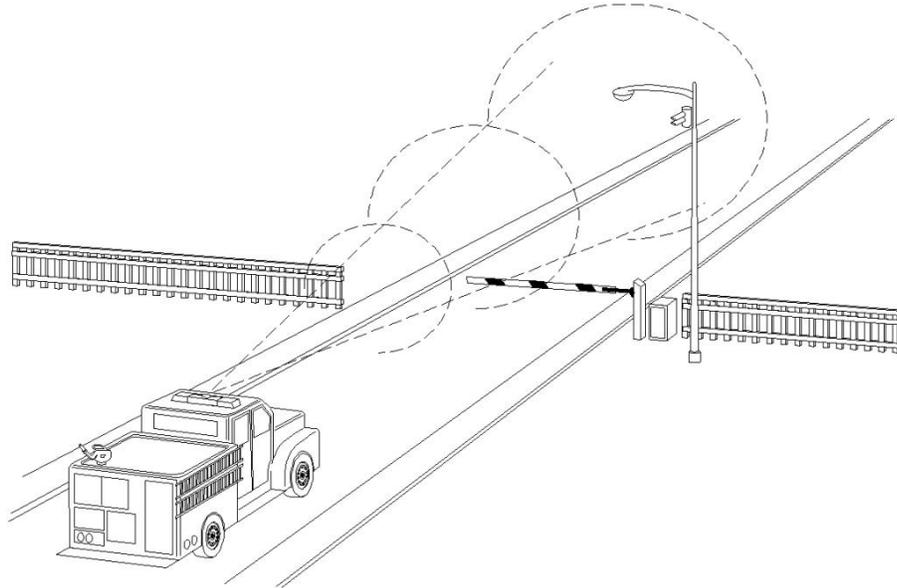


Figure 16-1

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.

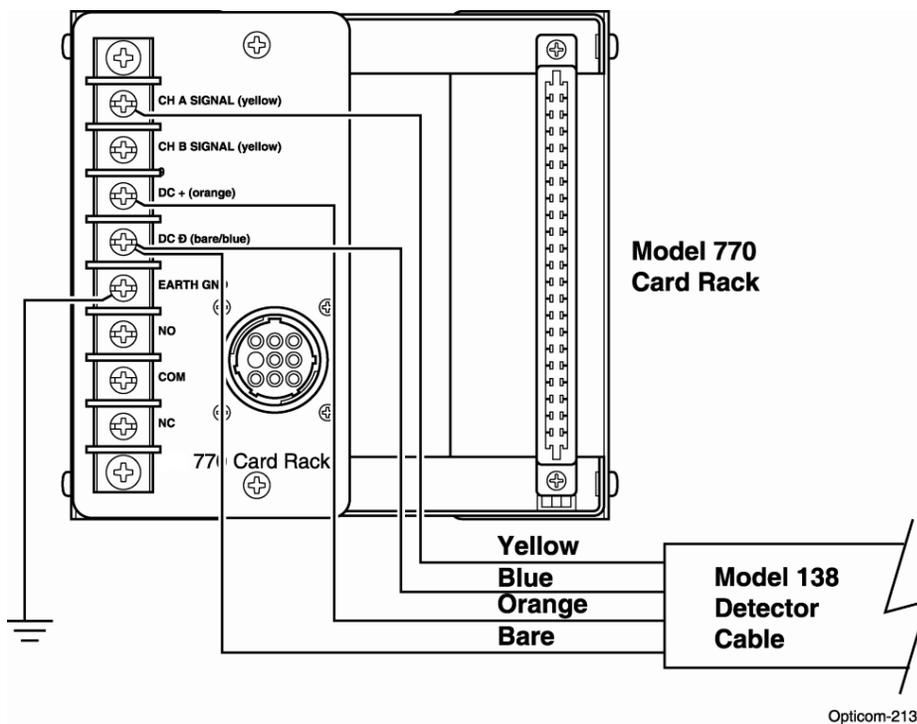
1. Place the card rack at the desired location in the gate opener controller cabinet. The card rack should be placed in a weather tight cabinet to protect it from rain, snow, etc.
2. Slide the phase selector into the slot in the card rack and press firmly to seat it into the card slot and edge connector.
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**

**Note:**

- Only rear outputs 1 and 2 are connected to the relay, therefore use one of these outputs when configuring the phase selector.

# Installation Instructions

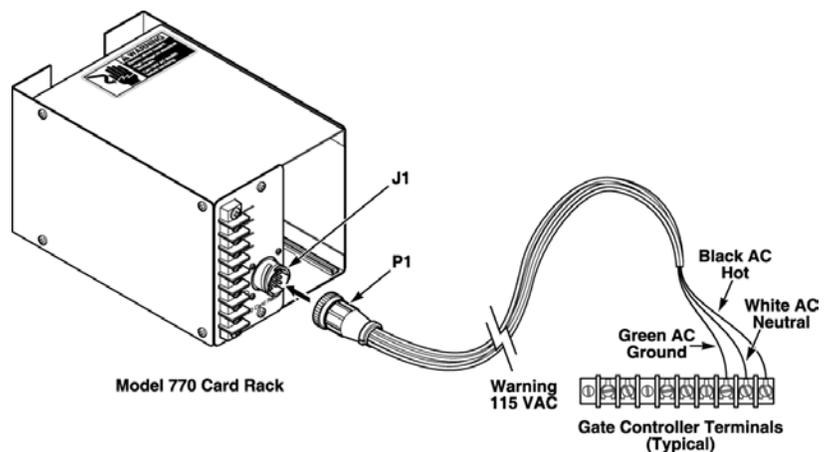
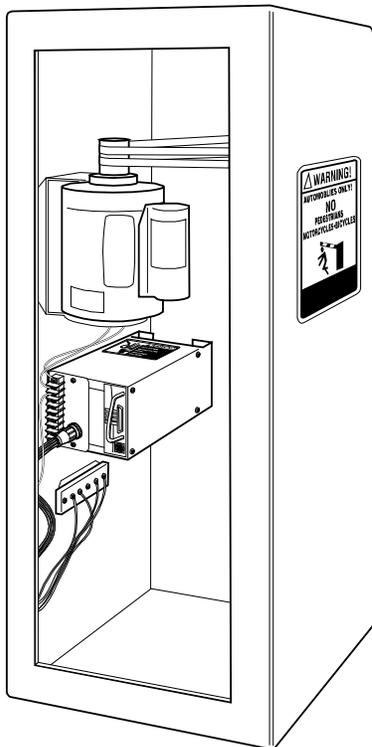
## 16.1.1 Gate Opener Relay Outputs

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.



Opticom-208A

Figure 16-4 Card Rack Harness Wiring

Figure 16-3 Typical Gate Opener Cabinet

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Since the availability of a GPS signal is out of GTT's control and is required for Opticom™ GPS system operations, GTT does not warrant against Opticom™ GPS system failures due to the unavailability of the GPS signal for any reason.



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