PTL 2.4x Portable Traffic Signal Manual









INTRODUCTION

Gen 3 controller software version: V39 08.08.19

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North America Traffic 7 Petersburg Circle Port Colborne, Ontario, Canada L3K 5V5 Toll free: 1-877-352-4626 (USA and Canada) Phone: 905-835-0800 Fax: 905-835-0453 info@northamericatraffic.com

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1 SAFETY OVERVIEW

1.1 TRAINING

All personnel operating the North America Traffic PTL 2.4x must be fully trained.

1.2 TOWING

Prior to transporting the PTL 2.4x (either individually and/or in tandem) complete the following checklist to ensure safety while in tow:

- All lock down points are secure including:
 - Horizontal and diagonal mast arm lock pins
 - Tongue hitch pins
 - Ball hitch coupler lock pin
 - Rear light post locking bracket
- Make sure there are **NO** "loose" objects sitting on the unit (check solar panel, top of battery box, fenders, bumpers, tongue, etc.)
- The batteries inside the battery box are secured correctly with the battery hold-downs and the battery box lid has been locked
- The solar array is in the correct position for travel
- The jacks are fully retracted and locked into place
- The controller cabinet door has been shut and secured
- The hitch safety chains are secured
- The connection for the trailer lights has been secured and tested (check right/left turn signals, hazard lights and brake lights for correct function)

Drive ahead about 10 feet and do a final walk around to ensure that all lock down points are secure; safety chains are crossed under the tongue and latched securely; and no tools or parts are sitting on the machine.

ADANGER failure to ensure that all of the above precautions have been taken can result in injury and/or death.

1.3 SIGNAGE AND WORK ZONE

It is the end user's responsibility to ensure that advanced warning signs and barricades are used in accordance with the local road authority guidelines.

1.4 ELECTRICAL HAZARDS

Before working on the electrical system, always disconnect the 24 VDC batteries (main power supply) and the solar panel to avoid injury.

1.5 BATTERY HAZARDS

Safety Precautions

Always use eye protection, a face guard and rubber gloves when working with batteries. Have an eye wash kit available at all times or tap water to flush acid out of eyes. Always have water and baking soda available to wash off and neutralize acid when it comes in contact with skin. If acid is taken internally, drink large amounts of water and seek medical attention immediately.

Gas Explosion or Fire

Batteries release an explosive hydrogen gas while being charged. Keep cigarettes, sparks, flames, and any other ignition sources away at all times.

Acid Burns

Battery acid can cause burns if it comes in contact with exposed skin and can cause blindness when in contact with your eye(s). Always wear protective goggles and gloves when working with batteries.

Electrical Burns

An electrical short between the positive and negative terminals of the battery can cause severe burns and death, even though the voltage is low.

1.6 OVERHEAD HAZARDS

Prior to setting up the machine, ensure there is sufficient clearance to raise and lower the light post safely.

2 TERMS AND DEFINITIONS

Actuation – Traffic actuation allows traffic flow to control green times within specified timing parameters. A microwave traffic sensor, video detection or other actuation device, is attached to the machine which detects approaching traffic. When a vehicle is detected, the sensor sends a command to the controller putting that phase in queue (refer to Sensor Locking for further options). Only one signal in a phase needs to detect a vehicle in order for that phase to be placed in queue.

Phase – a movement of traffic that consists of a green, yellow and red clearance interval.

Cycle – the total time to complete one operation of all phases.

Queue – is an ordered series of upcoming phases that are created when vehicles are detected by a vehicle detector. Each phase in queue will become active in sequence once the preceding phase is complete.

Turn Phases:

Protected – assigns the right-of-way to drivers turning left and allows turns to be made only

on a green arrow display.

Permissive – operation requires left-turning drivers to yield to oncoming (or conflicting) vehicle and pedestrian traffic before completing the turn. A permissive left turn is served concurrently with the adjacent through movement.

Protected-Permissive – operation represents a combination of the permissive and protected modes. Left-turning drivers have the right-ofway during the protected left-turn phase. They can continue left turn movements "permissively" when the opposing through movement receives its circular green indication.

Signal Housings:

High-High – one traffic light is positioned 5.2m (17ft) above the roadway and the secondary traffic light is 5.2m (17ft) above the shoulder of the road.

High-Low – one traffic light is positioned 5.2m (17ft) above the roadway and the secondary traffic light is 2.7m (9ft) above the shoulder of the road.

3 Component Breakout

3.1 TRAILER



1. LED Signal Lamps and Housing

- 12" diameter, LED lamp module with high-flux lensing and complies with ITE standards.
- ITE certified polycarbonate housing with an aluminum backboard.
- Standard ball cap visors extend over each LED lamp by 10" (tunnel visors available).
- Back Lamp: 4" amber LED lamp mounted on the signal head provides phase status to workers in the construction zone. Behavior is displayed as:
 - Flashing = Phase status is GREEN
 - Solid = Phase status is AMBER or RED

2. Horizontal Mast Arm

• The galvanized/painted, steel telespar arm that contains the signal head(s) that are positioned over the roadway when fully deployed.

3. Communication Link (Radio Transceiver)

- A Radio Transceiver is installed in each PTL 2.4x Unit in order for the units to communicate.
- The Radio Transceiver is a 1-Watt system designed to communicate up to 1 mile (with line of sight).
 - The Unit operates on the approved frequency range as per the MUTCD/FCC Part 90.17 (910 MHz - 917 MHz spread spectrum, frequency hopping) – No FCC licensing required.

• High gain omni-directional antenna (standard on every trailer).

4. Diagonal Mast Arm Support

• the square, aluminum arm that connects the Horizontal Mast Arm to the Main Light Post.

5. Main Light Post

• the round, aluminum post. When deployed, this post sits in the vertical position.

6. Solar Array

- The solar panels supplied with every PTL 2.4x unit provides 400 Watts of power and are housed in an anodized aluminum frame.
- The solar energy is sent to the solar panel controller which then transfers the power to the battery bank.
- The energy generated by the solar panel assists in extending the autonomy of the unit not to charge the batteries to their maximum capacity; a full charge is achieved by using the 40 Amp smart charger.

7. Power Supply

- Power is supplied by either twelve (12) or sixteen (16) 6 Volt deep cycle batteries, in series-parallel to generate 24 VDC.
- Batteries are charged using the 40 Amp smart charger (external plug provided near cabinet door providing easy access for connection to a 120 VAC source).
- Batteries receive some assisted energy supplied by the solar array for more information see: item 6. **Solar Array** above.

Note: For more detailed information pertaining to batteries, charger, and solar array, refer to Section 13 Power System Information.

8. Trailer Section Components

- The Trailer Section for the PTL 2.4x includes the following features:
 - #10 Dexter torsion bar suspension axle
 - ST205/75R15 tires
 - Electric brakes
 - Removable tongue with two (2) locking pins
 - Four flat-mount screw jacks to level and stabilize
 - · All electrical and lighting requirements for highway driving
 - 2" Hitch Ball Coupler on tongue; 2" Ball Hitch mounted on rear frame for tandem towing
- The frame structure and all supports are welded and inspected by certified welders, implemented under ISO 9001:2015 guidelines.
- Approved for use on highways.

3.2 CABINET INTERNALS



- 1. **Controller** controls all functions of the PTL 2.4x.
- Transfer Flasher Relay (TFR) transfers control of the local signal indications in the event of a fault.
- 3. **Wiring Conduit** protected channel through which wires are routed.
- 4. **Terminal Block** all electrical inputs and outputs are applied here.
- 5. **Toggle Switches** main power on/off and lift system control switches.
- 6. **Battery Charger** used to charge the batteries when unit is plugged into a 120 VAC power source.
- 7. **Solar Controller/Regulator** stabilizes and transmits the energy collected by the solar panel to the battery bank.
- 8. **Fuse Block** fuses for all electrical functions.
- 9. **Isolated Power Distribution Studs** the distribution point to which power from the batteries, solar array and battery charger is connected to the signal control system and peripheral hardware.

4 Physical Setup/Takedown

ACAUTION

ALWAYS check for overhead power lines or utility lines in the immediate area to avoid contact with the light post and actuated mast arm. Move the machine to another location if necessary;

ACAUTION

ALWAYS raise the light post first, <u>before</u> extending out the horizontal mast arm. Failure to do so may place undue stress on the lift systems mechanics.

ACAUTION

Use Traffic Control Persons to control traffic flow when deploying and raising the light posts.

4.1 Setup

- 1. Put the PTL 2.4x in position on the side of the road.
- 2. Level and stabilize each unit with the four stabilizing jacks.
 - a. Remove cotter pin from locking pin.
 - b. While holding the base of the screw jack, remove locking pin.



- c. Place base of screw jack on the ground.
- d. Line up the nearest holes on the screw jack and put the locking pin through.
- e. Secure locking pin with cotter pin.
- f. Turn crank until screw jack is firmly on the ground.
- g. Repeat for each screw jack.
- h. Once completed, do a walk around and check to make sure none have lifted off the

ground, and that the trailer is level.

- 3. Disconnect PTL 2.4x tongue from the hitch of the towing vehicle.
- 4. Remove the wheels for added security using a standard tire iron (optional).
- 5. Remove the tongue from the front of the unit for added security (optional).

Note: The tongue weighs about 90 lbs, so 2 people may be needed.

- a. Unplug the running light cable from trailer.
- b. Remove locking pins from the tongue.



c. Firmly pull tongue forward until it is removed from the trailer.



d. Place tongue in safe location to prevent damage.

- 6. Unlock the mast arm from the mast arm support and move it into position.
 - a. Remove cotter pin from locking pin.
 - b. Remove locking pin.



- c. Swing the mast arm towards the front of the machine.
- d. Line up holes on mast arm with holes on mast arm support.
- e. Put locking pin in hole.
- f. Put cotter pin in locking pin.



- 7. Unlock the mast arm support from the signal post and move into position.
 - a. Remove cotter pin.
 - b. Remove locking pin.



c. Swing mast arm support towards the rear of the signal.



d. Continue swinging the mast arm until it stops at the signal post.



8. Raise the main light post.

Note: Ensure there is no overhead wires or obstructions when raising the main light post.

a. Ensure the lock bar is open.



- b. Open the control cabinet.
- c. On the switch plate, use the LIGHT POST toggle switch to raise the light post.
- d. Once the signal has been raised and is between the vertical supports, place the lock bar in place and lock with the pad lock provided.



- e. Once the main light post is deployed and locked in the vertical position, use the HORIZONTAL ARM toggle switch to extend the 17 foot signal housing over the roadway by an additional 44 inches.
- 9. Position the solar panels.
 - a. Using a 9/16" wrench, loosen the nuts found on each side of the solar panel support.



b. Tilt the solar panels to a 45° angle.



- c. Tighten the nuts on both sides of the solar panel support to secure the panels at a 45° angle.
- d. Loosen the solar panel horizontal lock bolt using a 3/4" wrench.
- e. Rotate the solar panel array until it is facing south and re-tighten the bolt.



4.2 TAKEDOWN

ACAUTION

ALWAYS check for overhead power lines or utility lines in the immediate area to avoid contact with the light post and horizontal mast arm.

ACAUTION

ALWAYS retract the horizontal arm first, <u>before</u> lowering the light post. Failure to do so may place undue stress on the lift systems mechanics.

ACAUTION

Use Traffic Control Persons to control traffic flow when lowering the light post system.

- 1. Position the solar panels in towing mode.
 - a. Loosen the solar panel horizontal lock bolt using a 3/4" wrench.
 - b. Rotate the solar panel array until it is square with the trailer.
 - c. Using a 9/16" wrench, loosen the nuts found on each side of the solar panel support.
 - d. Tilt the solar panels until it is at 0° (horizontal).
 - e. Tighten the nuts on both sides of the solar panel support to secure the panels at a 0° angle.



- 2. Lower the signal post.
 - a. Unlock the pad lock and open the signal post lock bar.



- b. Open the control cabinet. Using the HORIZONTAL ARM toggle switch, retract the signal housing on the horizontal mast arm.
- c. Lower the main light post using the LIGHT POST toggle switch until it rests on the horizontal support.
- 3. Move mast arm support into towing position.
 - a. Using the signal head, swing the mast arm support around towards the signal post.



b. Once it is over the trailer, step up onto the trailer.



- c. Push up on the mast arm support to place in between the supports and line up holes for locking pin.
- d. Put locking pin into holes.
- e. Put cotter pin into locking pin.



- 4. Move mast arm into towing position.
 - a. Remove the cotter pin from the locking pin.

b. Remove the locking pin.



- c. Swing mast arm toward the mast arm support.
- d. Push up on the mast arm to place in between the supports.



- e. Put locking pin in holes.
- f. Put cotter pin in locking pin.
- 5. Place tongue on machine.
 - a. Position tongue in front of machine.
 - b. Firmly slide tongue into trailer until the front and rear holes are lined up.
 - c. Insert the two locking pins.



d. Secure the locking pins with cotter pins.



- e. Plug in the trailer running light plug.
- 6. Raise screw jacks.
 - a. Connect trailer to truck using the ball hitch coupler.
 - b. Crank the screw jack until the base is off the ground.
 - c. Remove cotter pin.



- d. While holding the base of the screw jack, remove locking pin.
- e. Raise the base until the bottom hole is lined up with the main locking hole.
- f. Put the locking pin in the screw jack locking hole.
- g. Put the cotter pin in the locking pin.
- h. Repeat for all screw jacks.



4.3 MANUAL LOWERING OF THE LIGHT POST

The main light post and horizontal mast arm will need to be manually lowered in the event of:

- Dead batteries
- Actuator failure (inoperable)

Note: Use traffic control persons to control traffic flow when lowering the main light post and retracting the horizontal mast arm. There are TWO Models of Actuator, that could be potentially installed on your unit. They have different take-down procedures. Review the different models below before take-down.

WARNER LINEAR / THOMSON ACTUATOR

Tools Required: 3/16" Allen wrench, 1/4" drive ratchet with an extension or, to save time, a drill with at least an 8" extension.

Remove silver access cap on the actuator motor housing using a 3/16" Allen wrench. Using the 1/4" drive extension at least 8" in length, lower the main light post until it reaches the holding bracket (to prevent stripping, set the drill to a low clutch setting). If required, repeat the process for the horizontal mast arm to retract the light housing extension.



PROGRESSIVE AUTOMATION ACTUATOR:

Tools Required: T 30 Torx bit, 6mm hex bit with an extension or, to save time, a drill with at least an 8" extension.

Use the T-30 Torx bit to remove silver access cap on the actuator motor housing. Using the 6mm hex bit and drive extension, turning counterclockwise, lower the main light post until it reaches the holding bracket (to prevent stripping use the drill set to "screw" mode or the highest clutch setting). If required, repeat the process for the horizontal mast arm to retract the light housing extension.





4.4 OVERHEAD LIFTING

Always check for overhead power lines or utility lines in the immediate area to avoid contact with the trailer and light post. Also make sure there is enough clearance beside the machine when the mast arm is swung open.



Figure 1: Lift points on the PTL 2.4x

ACAUTION

- The PTL 2.4x weighs 2940 lbs (1334 kg). Ensure all lifting and rigging equipment is rated to lift the load.
- Failure to follow this instruction can result in damage to the trailer and associated equipment.
- 1. Open mast arm assembly to horizontal position (see Fig. 2, 3).

Note: Do not lift trailer with the light post in the vertical position.

- 2. Tilt the solar array to 60° (see Fig. 2, 3).
- 3. Connect straps as per trailer signal housing configuration (see Fig. 2, 3).



Figure 2: High-High Signal Configuration

Figure 3: High-Low Signal Configuration

4.5 SIGNAL HEAD ROTATION

The PTL 2.4x signal heads have the ability to turn 180° and face the opposite direction. This allows the unit to be placed on the opposite side of the road in the event that there is little to no shoulder.

High-Low

1. Remove the cotter pin and locking pin from the mast arm support.



- 2. Swing the mast arm towards the front of the machine.
- 3. Remove the bolt shown from the signal housing bracket. Loosen the other bolt if needed.



4. Pivot the signal head 180° and replace the bolt back into the corresponding hole.



5. For the lower signal head on the main light post, repeat steps 3-4.



High-High

- 1. Repeat steps 1-4 from the **High Low** instruction for the outside signal head.
- 2. For the other signal head located on the mast arm, remove both bolts as shown.



3. Stand up on the fender of the machine and flip the signal head 180° and replace both bolts.



4. Ensure all bolts are tightened.

5 CONTROLLER NAVIGATION

5.1 Controller Hardware

- Soft Buttons these 10 buttons have no specific assigned values. They will have a different value on each screen.
- 2. **BACK Button** returns to the previous menu screen.

3. L.E.D. Status Lights:

ALERT ● - indicates whether there is a fault or error message.

Note: Alert light will be illuminated for ² 15 seconds following power down of the system.²

BUSY • - USB in use, settings being saved or copied, unit warming up.

ON ● - power indication.

- ENTER Button used to confirm a selected value or open a parameter for editing.
- Directional Buttons allows the user to toggle through menus, various screens and cycling through parameters open for editing.
- 6. **USB Port** used to import/export software files, traffic control plans and fault/data logs.
- J-Plugs (J1/J2) I/O connections to the terminal block by means of wire harnesses.
- 8. **Serial Port (J0)** connection to radio transciever.
- Speaker emits audible notification to user when buttons are pressed. Also emits loud beeping when batteries are low.



5.2 CONTROLLER SOFTWARE

The systems tray will display pertinent information that is always visible.



- 1. **System Feedback** this will display any instructions, faults or error messages that occur.
- 2. Battery Voltage displays the current battery voltage.
- 3. Unit Identifier displays the machine designation, either Primary or Secondary X.
- 4. Radio Channel will display the current radio channel or show if the machine is hardwired.
- 5. **Radio Signal Strength** displays the signal strength percentage in 25% increments. This is a combination of radio signal strength and rate of data transfer within the network.
- 6. Menu Path this section displays where the user is located in the software.
- 7. **Program Version** will display the model of the unit and software version number.
- 8. **Date and Time** in the OPTIONS menu, the date and time can be set (HOME>OPTIONS PG 2).

5.3 System Passcode

To create a new passcode, go into options and scroll down to **EXAMPLE**. A prompt will appear to enter the current passcode. From factory, this passcode is:

0-8-0-0

Once this is entered, a prompt will appear to enter a new passcode. If your custom passcode is ever forgotten, call North America Traffic: 1-877-352-4626.

After a new passcode is set, in order to alter any settings, the software will need to be unlocked. This can be accomplished either by unlocking the software via the OPTIONS menu or by selecting any option to edit. Once selected, a prompt will appear to enter the passcode.

After assigning a custom passcode, if you wish to use additional unit(s) in conjunction with the current unit in operation, you must reprogram the additional unit(s) to the SAME SYSTEM PASSCODE.



Once unlocked, the only way to lock the software again is to go back to the OPTIONS menu and select the corresponding soft button.

> EB/01/17 09:53AM)GRAM: MODEL V##

> > next page 📥

ACTUATION

SIGNAL:



5.4 INTERNAL SOFTWARE NAVIGATION



1. In this case, the corresponding soft pages.

pages.

2. When "next page" is displayed, the \leftarrow and \rightarrow directional buttons will be used to toggle through

buttons will be used to toggle through

Editing Parameters:



Once a soft button is selected (i.e. Secondary 1 GREEN):

• Use the 📕 or 🕇 directional buttons to increase or decrease the highlighted integer.

- Use the 🗲 and 🏓 directional buttons to toggle between MAX and MIN times.
- Lock parameters in memory by pressing ENTER, pressing any other soft button, or by shifting the selection to the opposing timing input (MAX/MIN).

Toggling Through the Unit Diagnostic Tab:



Using the **+** and **+** directional buttons from the home screen will allow you to view the Phase Status and diagnostics for each unit in the network. Press ENTER to view the selected tab.

6 MENU SCREENS





Home Screen: Primary

6.1 CHANGE TIMING

CHANGE TIMING – the menu where the timing can be changed for each phase.



Distance – the user inputs the distance of the work zone (between vehicle stop points). The green, yellow, and red times will be automatically calculated, based on an engineer's certified timing chart. This feature is only active when ONE-WAY ZONE is selected.

Red Clear – Allows the user to set the red time required for vehicles to safely clear the work zone before the next green phase is served.

Yellow – Allows the user to set the yellow time for the signal when it transitions from green to red.

Green Max – Allows the user to set the maximum green time for the signal. When actuation is enabled, green max is the maximum amount of time the signal will stay green when continuous detector activations occur. If the green max time is reached, the signal transitions to the yellow time, followed by the red time and then the next phase will turn green. If actuation is disabled, green max is used as the standard green time.

Green Min (Min only appears when Actuation is enabled) – Allows the user to set the minimum green time for the signal. When in actuation, green min is the minimum amount of time the signal must stay green in the phase. When actuation is disabled, the green min time is not visible.

ACTUATION SETTINGS – Traffic actuation allows traffic flow to control green times within specified timing parameters. A microwave traffic sensor, video detection or other actuation devices, can be attached to the machine which detects approaching traffic. When a vehicle is detected, the sensor sends a command to the controller putting that phase in queue (refer to Sensor Locking for further options). Only one signal in a phase needs to detect a vehicle in order for that phase to be placed in queue.



Mode:

Rest Red – When actuation is set to "Rest Red", the signal will remain red until an approaching vehicle is detected. The first

approaching vehicle detected will send a command to the controller and that phase will become active. If an approaching vehicle is detected by another traffic sensor, that phase will be put in queue until the active phase is complete. Once all phases are complete and no further phases are in queue, all phases will remain red until a vehicle is detected.

Rest Green – When actuation is set to "Rest Green", it will remain green following actuation and expiry of the green time, while the other phase will remain red until a vehicle is detected. If an approaching vehicle is then detected by another traffic sensor, that phase will be put in queue until the active phase has reached the minimum green time and no vehicles are in queue or have reached the maximum green time, regardless of vehicles being in queue. The phase with the vehicle in queue will become active and will remain green until a vehicle is detected by a traffic sensor assigned to another phase.

Last Served – When actuation is set to "Last Served", the machine will turn green when it has been actuated and will remain in this state until another machine within the same network is actuated.

Nil (Fixed Time) – a preset time given to each movement, every cycle, regardless of changes in traffic conditions.

6.2 WORK ZONE SETUP



Locking – Enables the controller to remember or hold a vehicle call (even after the calling vehicle leaves the detection area) until satisfied by the appropriate green indication.

Yellow Lock – The controller "remembers" vehicle actuations that occur during the yellow and red display of the signal phase. When the controller determines if the phase should be called for service, it uses the remembered actuations to call the phase to service, even if the detected vehicle has since left.

Non-Lock – The controller does not remember actuations and the phase will be called to service only if it has a currently occupied detector area.

Passage Time – the interval of time that is added to the minimum green time for each vehicle actuation, until the maximum green time is reached.

Force Minimum Recall – in the absence of a vehicle call on the phase, a temporary call to service the minimum initial time will be placed on the phase. If a vehicle call is received prior to the phase being serviced, the temporary call will be removed.

Unit ID – used to designate each unit as either a primary or secondary machine. Each unit will have a different designation. Only 1 primary machine is needed per work zone.

Radio Channel – there are 10 radio channels and 1 hardwire setting available. Every machine in the work zone must be on the same radio channel in order to work together.

Site Layout – the site layout tab allows the user to select a predefined layout to suit the work zone. There are 20 layouts to choose from.

Timing – this selection is a shortcut to the CHANGE TIMING screen which allows you to set the signal timing for the signals in the work zone. This can only be done on the primary controller.

6.3 Options



Control Mode – five different modes can be used to operate the system.

Automatic – in automatic mode, the machines will communicate automatically with one another based on how the site layout has been assigned. It also allows for a manual override using the radio remote.

Manual – in manual mode, the radio remote is required. The red button on the radio remote will initiate an ALL STOP command, the green button will turn the Primary signal green, and the black button will turn the Secondary signal green. Manual mode can only be used with site layouts that consist of up to two phases. *Note: An ALL STOP must be initiated prior to changing green signals.*

Pilot Car Mode – a pilot car equipped with a radio remote can control the work zone without the need for a flagger. A hardwired remote can also be employed.

Single Unit - Manual – in single unit manual, the unit will be controlled solely by the radio remote.

Single Unit - Auto – in single unit auto, the unit will run automatically based on the timing settings.

Sync Radio Remote – the radio remote can be programmed to the same radio channel as the unit(s) by selecting SYNC RADIO REMOTE in the software and following the instructions on the screen.

Fault Logs – used to log each fault that occurs with the date and time, and type of fault. Up to 10,000 faults are held in memory.

Clear Fault – a fault can only be cleared once it has been resolved.

Export All Logs – fault logs and data logs can be exported via USB as a .csv file.

Default Behavior – allows the user to set the signal default mode that will be displayed in the event of a fault (displayed across network). *Note: Each Secondary unit can be modified independently to that of the Primary unit. However, a change to the SITE LAYOUT or to the PRIMARY DEFAULT setting will reset all Secondary unit settings to match the Primary.*

Flash Red – signal lamps will display flashing red upon startup and faults.

Solid Red – signal lamps will display solid red upon startup and faults.

Flash Yellow – signal lamps will display flashing yellow upon startup and faults.

Transition to Default – the way the lamps will change from normal operation to default mode. Either "Include Yellow Change" or "Bypass Yellow Change".

Include Yellow Change – when a program is operating, and a fault occurs, the Green phase is terminated and will go to Yellow, then Red, then the set Default mode.

Bypass Yellow Change – when a program is operating, and a fault occurs, the Green phase is terminated and will go straight to the set Default mode.

Auxiliary Lamps – additional lamps to notify workers of the signal lamp(s) status, or notify emergency vehicles of an accepted preemption call.

Back Lamp – a 4" amber lamp used to notify the workers within the work zone. When the corresponding signal head is in its green phase, the back lamp displays flashing amber. When the corresponding signal head is in its yellow change or red clearance phase, the back lamp displays a solid amber indication.

Emergency Vehicle Preemption Lamp – a 4" white lamp used to notify emergency vehicles that the signals have been preempted and a corresponding green phase will be served, when safe to do so. Used in conjunction with emergency vehicle preemption detection.

Communication Settings – used for radio communication setup.



Drop Out Time – the machine will go into default mode if radio communication is lost for more than the specified time.

Auto Restart Functions – used to restart the program upon the primary unit's return from a communication loss or power loss.

Communication Regain – in the event of communication being restored, the program will auto restart (if enabled).

Dead Battery State – when the batteries reach 23.0 V, the unit will enter default operation. Normal operation will be restored once the batteries reach the low battery state of 23.6 V or greater.

Blackout – when the batteries reach 21.0 V, the lamps go dark but the GUI is still operational. Normal operation will be restored once the batteries reach the low battery state of 23.6 V or greater.

Set New Passcode – user selectable passcode used to unlock the software settings (see Section 5.3 System Passcode).

Date & Time – the date and time can be set by using the up and down arrow buttons to select the value and the right and left arrow buttons to toggle horizontally.

Software Import/Export – software updates and preprogrammed traffic plans can be imported via flash drive. Exporting can be used to save plans. This will save all settings to the USB flash drive.

Level of Operation – two types of methods to setup a unit; Basic and Advanced.

Basic – quick, easy setup using predefined layouts (see Section 7 Setting UP A WORK ZONE).

Advanced – ring and barrier based traffic control. The advanced mode will change the UI slightly (see SECTION 8 Advanced Mode).



Compatibility With – allows the Gen 3 system to operate with older Gen 1 or 2 controllers. If compatibility with an older Gen controller is selected, some programming options within the Gen 3 software will be inaccessible (grayed out) in order to comply with the older versions (see SECTION 9 COMPATIBILITY MODE).

Note: When operating in Gen 1 or 2 compatibility mode, the Gen 3 system must ALWAYS be the PRIMARY unit. The Gen 1 or 2 units shall all be set as SECONDARY units.

Auxiliary Equipment

AWF Units – timing inputs to control the on/ off flash times of Advanced Warning Flashers (AWF).

DAD Change Interval – enable/disable the way in which the Driveway Assistance Device(s) (DAD) transition from displaying a flashing arrow to the solid red indication. ENABLE allows the flashing arrow to transition to a solid arrow display for the duration of the yellow change interval before proceeding to the solid red indication.

Factory Settings – gives you the option to enable or disable display dimming and TFR hardware.

Display Dimming – When enabled, if no button on the controller is pressed for 10 minutes, the screen will go black. Press any button to illuminate the screen.

Transfer Flasher Relay (TFR) Hardware – the TFR is used for transferring control of the local signal indications in the event of a fault. *Note: Disabling the TFR requires wiring changes. Contact NAT before altering this setting.*

Set Model – Manufacturer access only. Contact NAT for further details.

Motor Control – This feature enables or disables the operation sequence of the light post lift systems by means of the controller

interface on models PTL 2.4x and PTL 2.4LD. Contact North America Traffic before altering this setting.

6.4 Starting Operations

DEFAULT FLASH R PRESS START TO	RED Resume	FI PR(EB/01/17 09:53AM DGRAM: MODEL V##
BATTERY: 24.0 VOLTS		HOME	
UNIT: PRIMARY	RADIO CHANNEL:	03 RADIO	SIGNAL:
OPERATOR SHALL BE FULLY CHANGE TIMING	TRAINED		START
LIGHT POSTS 🔶	∕↓		FLASH YELLOW
WORK ZONE SETUP			PLASH RED
OPTIONS	C	?	HELP
PRI SEC1			PHZ

Both FLASH YELLOW and FLASH RED function as a regular program. To stop, user must push ALL STOP.

Start Program – can be selected on the HOME screen or CHANGE TIMING screen at any point after the timing has been set. It is recommended that timing is reviewed to ensure correct settings.

Flash Yellow – will flash the yellow signal lamps until program is stopped.

Flash Red – will flash the red signal lamps until program is stopped.

6.5 HELP

The HELP feature is currently in development. This section will be populated with the most common trouble shooting tips. Currently, all the input and output (I/O) diagnostics can be viewed here and language settings can be changed.

DEFAULT FLASH R	ED	FEB/	01/17 09:53AM
PRESS START TO	RESUME	PROGR	AM: MODEL V##
BATTERY: 24.0 VOLTS	RADIO CHANNEL:	HOME > HELP	> IO DIAG
UNIT: PRIMARY		03 RADIO SI	GNAL:
RED1 24.1V AMB1 00.0V GRN1 00.0V 0.00A RED2 00.0V AMB2 00.0V GRN2 00.0V 0.00A RED3 00.0V 0.00A GRN3 00.0V 0.00A	ARM1+ ARM1- 0.00A ARM2+ ARM2- 0.00A ARM2- 0.00A B BTN G BTN OUT Radio IN	SOLAR 00.0 BATTERY 24.0 INT TEMP 26.0 PDBK7 1 OUT1 0 OUT2 1 OUT3 1 OUT4 0 OUT5 0 OUT6 0	V V egrees C SEN1 SEN2 SEN3 SEN4 SEN5 SEN6 SEN7 SEN8

Language Settings:

- Permits the user to toggle the GUI display language between English and Spanish
- To change the language settings;

Note: these instructions will assist with changing the operating system language from Spanish (ESP) to English (ENG).

- Select AJUSTES DE IDIOMA (LANGUAGE SETTINGS).
- Select SELECCIONE EL IDIOMA (SELECT LANGUAGE).
- Use the DOWN arrow button to toggle the selection to ENGLISH; press the ENTER button.
- Power off the system and wait 15 seconds for the controller to fully power down (LED lights on faceplate go dark).

Note: this step is required to implement the language settings change. Failure to do so will leave the language set to ESPAÑOL.

• Turn the power back on and operate the system as required.

7 Setting Up a Work Zone

When setting up a work zone, one unit must be set as the Primary Unit, and all others set as Secondary units. All Secondary Units should be powered on first. Edit the WORK ZONE SETUP and OPTIONS menu settings as shown below on the Primary and Secondary controllers; starting with the Secondary Units.

Note: When using multiple secondary units, they must always be in numerical order within the network. (i.e. SEC 1, SEC 2, SEC 3, etc.)

Secondary Setup

- 1. Proceed to a secondary unit and turn the power on.
- 2. Select WORK ZONE SETUP.
- 3. Select UNIT ID and proceed to change the unit ID to the required Secondary ID.
- 4. Select RADIO CHANNEL and select the desired channel number.

Note: All units to be networked must be on the same RADIO CHANNEL.

Hardwired connection can be selected (requires additional hardware and wiring)

DEFAULT FLASH RED PRESS START TO RESUME	FEB/01/17 09:53AM PROGRAM: MODEL V##	DEFAULT FLASH R PRESS START TO	RED Resume	FEB/01/17 09:53AM PROGRAM: MODEL V##
BATTERY: 24.0 VOLTS UNIT: SECONDARY 1 RADIO CHANNEL: 03 Operator Shall be fully trained	HOME RADIO SIGNAL:	BATTERY: 24.0 VOLTS UNIT: SECONDARY 1	RADIO CHANNEL: 03	HOME > WZ SETUP RADIO SIGNAL:
		UNIT ID	SECONDARY	1
LIGHT POSTS		RADIO CHANNEL	03	
WORK ZONE SETUP 💄				
OPTIONS	P HELP			
PRI SEC1	PHZ			

- 5. Press the BACK button to return to the HOME screen.
- 6. Repeat steps 3 to 5 for each secondary unit.
- 7. Proceed to primary unit to continue setup.

Primary Setup

- 1. Proceed to Primary unit.
 - a. Select WORK ZONE SETUP.
 - b. Set the UNIT ID to Primary.
 - c. Choose the RADIO CHANNEL that was chosen on the secondary units.
 - d. Select the LAYOUT based on your work zone. Refer to SECTION 7.1 LAYOUTS (BASIC MODE) for a detailed list of all available layouts.
 - e. Select TIMING.
 - i. Edit Unit (Phase) timing; RED CLEAR, YELLOW, GREEN (MAX and MIN when actuation is enabled).
 - ii. Select ACTUATION SETTINGS (if vehicle detection is used).

- iii. Select MODE; Rest Red, Rest Green, Last Served, Nil (Fixed Time).
- iv. Edit LOCKING; YELLOW LOCK or NON-LOCK.
- v. Enter PASSAGE TIME.
- vi. Enter FORCE MIN RECALL time (if applicable).
- f. Ensure unit is set to desired CONTROL MODE (AUTO or MANUAL). See OPTIONS PAGE 1>CONTROL MODE.
- g. Select START PROGRAM (program can be started from the CHANGE TIMING screen or the HOME screen).

7.1 LAYOUTS (BASIC MODE)

Note: The shaded areas indicate which layouts are shown as diagrams on the following pages.

Layout	Units Required	Control Mode
One-Way Zone	Primary, Secondary 1	Auto/Manual/Pilot Car
One-Way 1 Side	Primary, Secondary 1, 2	Auto
One-Way 2 Side	Primary, Secondary 1, 2, 3	Auto
One-Way 3 Side	Primary, Secondary 1, 2, 3, 4	Auto
One-Way 4 Side	Primary, Secondary 1, 2, 3, 4, 5	Auto
One-Way 5 Side	Primary, Secondary 1, 2, 3, 4, 5, 6	Auto
One-Way 6 Side	Primary, Secondary 1, 2, 3, 4, 5, 6, 7	Auto
One-Way 1 Cross Road	Primary, Secondary 1, 2, 3	Auto
One-Way 1 Cross 1 Side	Primary, Secondary 1, 2, 3, 4	Auto
One-Way 1 Cross 2 Side	Primary, Secondary 1, 2, 3, 4, 5	Auto
One-Way 2 Cross Roads	Primary, Secondary 1, 2, 3, 4, 5	Auto
One-Way 2 Cross 1 Side	Primary, Secondary 1, 2, 3, 4, 5, 6	Auto
One-Way 2 Cross 2 Side	Primary, Secondary 1, 2, 3, 4, 5, 6, 7	Auto
Two-Way Zone (Manual Mode)	Primary, Secondary 1	Manual
Two-Way 1 Side	Primary, Secondary 1, 2	Auto
Two-Way 2 Side	Primary, Secondary 1, 2, 3	Auto
Two-Way 3 Side	Primary, Secondary 1, 2, 3, 4	Auto
Two-Way 4 Side	Primary, Secondary 1, 2, 3, 4, 5	Auto
Two-Way 1 Cross Road	Primary, Secondary 1, 2, 3	Auto/Manual
Two-Way 2 Cross Roads	Primary, Secondary 1, 2, 3, 4, 5	Auto

Disclaimer

Please consult the presiding traffic control manual to ensure proper work zone setup. The following illustrations are not drawn to scale and are meant to be used as a guide in determining the proper setup of the signals. In no way do these illustrations reflect the appropriate signal setup for all work zones. Signal position and timing should be approved by the presiding authority or project engineer prior to use.

ONE-WAY ZONE



UNIT ID	WORK ZONE SETUP	SECONDARY 1

RADIO CHANNEL 0-9, HARDWIRED SECONDARY 1 SETTINGS

PRIMARY

LEVEL OF OPERATION COMPATABILITY WITH ***DEFAULT BEHAVIOUR CONTROL MODE **OPTIONS** SETTINGS BASIC GEN 3 Choose: AUTO OR MANUAL Choose: FLASH RED, SOLID **RED or FLASH YELLOW** SETTINGS

LAYOUT TIMING RADIO CHANNEL UNIT ID WORK ZONE SETUP ONE-WAY 0-9, HARDWIRED PRIMARY SETTINGS

CHANGE TIMING *DISTANCE LENGTH OF WORK ZONE (see 6.1 CHANGE TIMING) SETTINGS

**GREEN YELLOW RED CLEAR

MIN: 1-300 MAX: 1-300

1-15 (seconds) 1-600 (seconds)

(stop bar to stop bar)

******MIN only active when ACTUATION is enabled *Only applicable for ONE-WAY ZONE ***Default Behaviour Settings can be applied to all units in the

or customized per unit.

**Default Behaviour Settings can be applied to all units in the network,

network, or customized per unit.



Note: each additional side road requires another secondary unit.

SECONDARY 1-2	
WORK ZONE SETUP	SETTINGS
UNIT ID RADIO CHANNEL	SECONDARY 1-2 0-9, HARDWIRED
PRIMARY	
OPTIONS	SETTINGS
CONTROL MODE	Choose: AUTO
**DEFAULT BEHAVIOUR	Choose: FLASH RED, SOLID
LEVEL OF OPERATION	BASIC
COMPATABILITY WITH	GEN 3
WORK ZONE SETUP	SETTINGS
UNITID	PRIMARY
RADIO CHANNEL	0-9, HARDWIRED
LAYOUT TIMING	ONE-WAY 1 SIDE
CHANGE TIMING	SETTINGS
RED CLEAR	1-600 (seconds)
YELLOW	1-15 (seconds) MIN: 1-300 MAX: 1-300
Acad Structure View With the View MINA	
*MIN only active when ACTUATION is enab	

ONE-WAY 1 SIDE

ONE-WAY 1 CROSS ROAD



Note: each additional cross road requires to SECONDARY 1-3	vo secondary units.
WORK ZONE SETUP	SETTINGS
UNIT ID RADIO CHANNEL	SECONDARY 1-3 0-9, HARDWIRED
PRIMARY	
OPTIONS	SETTINGS
CONTROL MODE	Choose: AUTO
SETTINGS	Choose: FLASH RED, SOLID RED or FLASH YELLOW
LEVEL OF OPERATION	BASIC
COMPATABILITY WITH	GEN 3
WORK ZONE SETUP	SETTINGS
UNIT ID	PRIMARY
RADIO CHANNEL	0-9, HARDWIRED
TIMING	UNE-WAY 1 CRUSS RUAD
	(אבר ס. ד כדואוועם)
	SETTINGS
YELLOW	1-15 (seconds)
*GREEN	MIN: 1-300 MAX: 1-300
*MIN only active when ACTUATION is ena **Default Behaviour Settings can be appl	bled ed to all units in the network,
or customized per unit.	



N is enabled be applied to all units in the network,	*MIN only active when ACTUATIO **Default Behaviour Settings can or customized per unit.
SETTINGS	CHANGE TIMING
1-600 (seconds)	RED CLEAR
1-15 (seconds)	YELLOW
MIN: 1-300 MAX: 1-300	*GREEN
SETTINGS	WORK ZONE SETUP
PRIMARY	UNIT ID
0-9, HARDWIRED	RADIO CHANNEL
ONE-WAY 2 CROSS ROADS	LAYOUT
(see 6.1 CHANGE TIMING)	TIMING
SETTINGS	OPTIONS
Choose: AUTO	CONTROL MODE
Choose: FLASH RED, SOLID	**DEFAULT BEHAVIOUR
RED or FLASH YELLOW	SETTINGS
BASIC	LEVEL OF OPERATION
GEN 3	COMPATABILITY WITH
SECONDARY 1-5 0-9, HARDWIRED	UNIT ID RADIO CHANNEL PRIMARY
quires two secondary units. SETTINGS	Note: each additional cross road re SECONDARY 1-5 WORK ZONE SETUP



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WORK ZONE SETUP	SETTINGS
UNIT ID RADIO CHANNEL	SECONDARY 1 0-9, HARDWIRED
PRIMARY	
OPTIONS	SETTINGS
CONTROL MODE SYNC RADIO REMOTE	Choose: MANUAL Follow screen instructions
**DEFAULT BEHAVIOUR	Choose: FLASH RED, SOLID
SETTINGS	RED or FLASH YELLOW
LEVEL OF OPERATION	BASIC
COMPATABILITY WITH	GEN 3
WORK ZONE SETUP	SETTINGS
UNIT ID	PRIMARY
RADIO CHANNEL	0-9, HARDWIRED
LAYOUT	TWO-WAY ZONE
TIMING	(see 6.1 CHANGE TIMING)
CHANGE TIMING	SETTINGS
RED CLEAR	1-600 (seconds)
YELLOW	MIN: 1-300 MAX: 1-300
** Default Behaviour Settings can be app	abled lied to all units in the network,
or customized per unit.	



Note: each additional side road requires a SECONDARY 1-2	nother secondary unit.
WORK ZONE SETUP	SETTINGS
UNIT ID RADIO CHANNEL	SECONDARY 1-2 0-9, HARDWIRED
PRIMARY	
OPTIONS	SETTINGS
CONTROL MODE	Choose: AUTO
**DEFAULT BEHAVIOUR SETTINGS	Choose: FLASH RED, SOLID RED or FLASH YELLOW
LEVEL OF OPERATION	BASIC
COMPATABILITY WITH	GEN 3
WORK ZONE SETUP	SETTINGS
UNITID	PRIMARY
RADIO CHANNEL	0-9, HARDWIRED
TIMING	I WU-WAY I SIDE (see 6.1 CHANGE TIMING)
CHANGE TIMING	SETTINGS
RED CLEAR	1-600 (seconds)
YELLOW	1-15 (seconds)
*GREEN	MIN: 1-300 MAX: 1-300
*MIN only active when ACTUATION is er **Default Behaviour Settings can be app or customized per unit.	abled blied to all units in the network,





WORK ZONE SETUP	SECONDARY 1-3
SETTINGS	

 WORK ZONE SETUP
 SETTINGS

 UNIT ID
 SECONDARY 1-3

 RADIO CHANNEL
 0-9, HARDWIRED

PRIMARY

OPTIONS	SETTINGS
CONTROL MODE	Choose: AUTO or MANUAL
**DEFAULT BEHAVIOUR	Choose: FLASH RED, SOLID
SETTINGS	RED or FLASH YELLOW
LEVEL OF OPERATION	BASIC
COMPATABILITY WITH	GEN 3
WORK ZONE SETUP	SETTINGS
UNIT ID	PRIMARY
RADIO CHANNEL	0-9, HARDWIRED

 LAYOUT
 TWO-WAY 1 CROSS ROAD

 TIMING
 (see 6.1 CHANGE TIMING)

 CHANGE TIMING
 SETTINGS

 RED CLEAR
 1-600 (seconds)

 YELLOW
 1-15 (seconds)

 *GREEN
 MIN: 1-300 MAX: 1-300

 *MIN only active when ACTUATION is enabled
 **Default Behaviour Settings can be applied to all units in the network,





or customized per unit.

SINGLE UNIT-MANUAL



PRIMARY	
OPTIONS	SETTINGS
CONTROL MODE	Choose: SINGLE UNIT
SYNC RADIO REMOTE	Follow screen instructions-
DEFAULT BEHAVIOUR	Choose: FLASH RED, SOLID
SETTINGS	RED or FLASH YELLOW
LEVEL OF OPERATION	BASIC
WORK ZONE SETUP	SETTINGS
UNITID	PRIMARY
RADIO CHANNEL	6-0
LAYOUT	SINGLE UNIT (Default)
TIMING	(see 6.1 CHANGE TIMING)
CHANGETIMING	SETTINGS
*DISTANCE	LENGTH OF WORK ZONE
	(stop bar to stop bar)
RED CLEAR	1-600 (seconds)
	I-ID (SECOLIUS)
GREEN	Not applicable in manual
	control
*only applicable for ONE-WAY ZONE	



PRIMARY	
OPTIONS	SETTINGS
CONTROL MODE	Choose: SINGLE UNIT
DEFAULT BEHAVIOUR	Choose: FLASH RED, SOLID
SETTINGS	RED or FLASH YELLOW
LEVEL OF OPERATION	BASIC
WORK ZONE SETUP	SETTINGS
UNITID	PRIMARY
RADIO CHANNEL	0-9, HARDWIRED
LAYOUT	SINGLE UNIT (Default)
TIMING	(see 6.1 CHANGE TIMING)
CHANGE TIMING	SETTINGS
RED CLEAR	1-600 (seconds)
YELLOW	1-15 (seconds)
*GREEN	MIN: 1-300 MAX: 1-300
*MIN only active when ACTUATION is enak	oled

8 Advanced Mode

Advanced Mode is a useful tool that enables the operator full control over the traffic flow and traffic control trailers.

To set a unit into ADVANCED MODE, from the home screen select OPTIONS. Scroll down the options pages until LEVEL OF OPERATION is in view. Change LEVEL OF OPERATION from BASIC to ADVANCED. Next, ensure COMPATIBILITY is set to GEN 3. Return to the HOME screen.

8.1 NAVAGATION

From the home screen select WORK ZONE SETUP, then PHASE SETTINGS.

In PHASE SETTINGS, a NEMA phase diagram can be edited to create a completely unique and customizable work-zone traffic setup.



1. Systems Tray

2. NEMA Phase Diagram (see section 8.2)

- a. Ring One
- b. Ring Two
- 3. Isolated Phase Within Diagram
- 4. Plans
 - a. **View/Edit Plan Number** the plan currently displayed for editing. Up to 10 plans can be stored in memory.
 - b. Active Plan Number the plan that is selected will operate when START PROGRAM is activated.
- 5. Day(s) of Week to Operate
- 6. Start Times per Day(s)
- 7. Cursor Location shaded in grey.
- 8. Phase Column associated timing parameters and settings for that phase number.

9. Phase Settings Chart - the area used to input timing parameters and settings for all phases.



- The hard arrow buttons will move the selection box around the screen.
- Pressing ENTER will open the highlighted parameter for editing.
- Moving the selection box through the phase columns chart will cause the associated phase in the NEMA phase diagram to be highlighted accordingly.
- Pressing ENTER on the PHASE number in the phase settings chart will bring up further editing options. This includes APPLY VEHICLE MOVEMENT, ASSIGN UNITS, and ASSIGN BARRIER.
- The selection box can be moved up to the TIME OF DAY tabs to edit DAYS OF THE WEEK and START TIME.
- More phase settings options can be found by moving the selection cursor down in the phase settings chart.
- Plans will automatically be saved when exiting the Phase Settings screen or moving from one plan to another.

8.2 NEMA DIAGRAM

A NEMA Phase Diagram is an industry standard for traffic control diagrams. Below is a diagram along with labeled parts, as it appears on the GEN 3 controller.



- 1. Phase currently selected for editing
- 2. Assigned Unit(s) and signal head(s) to the phase
- 3. Applied Vehicle Movement
- 4. Barriers Applied

8.3 Editing a Phase

First select a plan to edit. Use the side soft button to select VIEW/EDIT PLAN NUMBER. Use UP and DOWN arrow buttons to cycle through editable plans.

Move the cursor to the phase (1-8) to be edited. The grey highlighted rectangle indicates the selected box. Press ENTER on the slected box to edit the phase.



The top of the next screen will show which phase is being edited. The user can proceed to edit the following settings:

APPLY MOVEMENT

Apply the direction of traffic flow relative to the traffic control trailer being assigned in ASSIGN UNITS drop down menu.



ASSIGN UNITS

HOME > WZ SETUP > PHASE SETTINGS > EDIT PHASE 1 FEB/01/17 09:53AM								
		HEAD A	HEAD B	SENSOR INPUT 32	SENSOR INPUT 33			
	PRI	R-Y-G		POS +				
APPLY MOVEMENT	SEC1							
	SEC2							
ASSIGN UNIT(S)	SEC3							
	SEC4							
ASSIGN BARRIER	SEC5							
	SEC6							
	SEC7							
	SEC8							

Assign which signal head and lamps are to be used per machine for only that phase. (Primary, Secondary 1, etc.). In addition, assign actuation inputs (ex. Microwave Traffic Sensor) to each machine as required. *Note: Sensor 32 pairs with Head A, Sensor 33 pairs with Head B.*



Note: If both heads A and B are to be assigned to the same phase, (ie. a turn movment) ensure both are activated in ASSIGN UNITS for that phase.

TURN PHASES



OUTPUTS	PERMISSIVE	PROTECTED	PROTECTED- PERMISSIVE
R-Y-G	\checkmark	\checkmark	\checkmark
Y-G			\checkmark
G		\checkmark	\checkmark

Note: Wiring and hardware changes may be required to setup custom turn movements. Contact North America Traffic for further detail.

ASSIGN BARRIER

Barriers provide a synchronization point between Ring 1 and Ring 2 on the NEMA phase diagram. Two barriers can be created (A and B). Assigning a barrier to a phase will also apply the same barrier to the corresponding phase in the opposite ring. (ie. assign to Phase 2 means it is also assigned to Phase 6.)

APPLY PARALLEL MOVEMENT

Movements can be run in parallel with the main

vehicle movement. Assign units to the parallel movement in the same way as the main vehicle movement.

The Editing Phases chart below indicates the permissable parallel movement for every vehicle movement.

	Editing Phase	S	
	APPLY MOVEMENT	APPLY PARALLEL MOVEMENT (permissible based on choice of B column)	
		SOUTH	
	NORTH	NORTH WEST	
		PED NORTH SOUTH	
		NORTH	
	NORTH WEST	SOUTH EAST	
		NORTH	
	SOUTH	SOUTH EAST	
DIRECTION		PED NORTH SOUTH	
		SOUTH	
	SOUTH EAST	NORTH WEST	
		WEST	
DIRECTION	EAST	EAST NORTH	
		PED EAST WEST	
		EAST	
	EAST NORTH	WEST SOUTH	
		EAST	
	WEST	WEST SOUTH	
		PED EAST WEST	
		WEST	
	WEST SOUTH	EAST NORTH	
	PED N/S	PED N/S	
	PED E/W	PED E/W	

Once a phase has been edited press the BACK button to save changes and go back to the PHASE SETTINGS screen.

EDIT PHASE TIMING

Each phase has a column of editable parameters.

To edit, use the arrow buttons to move the cursor to the desired parameter. Press ENTER to edit the selection and use the UP and DOWN arrows to cycle through available options or increase/ decrease timing parameters. Press the BACK or ENTER button to lock a parameter in memory.

The following parameters can be edited seperately for each phase (column). *Note: There are two pages of options and parameters. Use the UP and DOWN arrow buttons to navigate to both pages.*

• MIN GREEN - The minimum time in seconds

a phase will remain green. Used only when actuation is enabled.

- **MAX GREEN** The maximum time in seconds a phase will remain GREEN until it returns to RED.
- **YELLOW** The YELLOW time in seconds between the transition from GREEN to RED.
- **RED** The time in seconds phase will be RED before serving the next phase.
- **PASSAGE (Gap, Extension)** The amount of time in seconds added to the green interval for every vehicle detection that occurs. It begins counting down when the vehicle detection (actuation) is removed.
- **CALL** Parameters that pertain to the use of actuation. Each available option is defined below.

MIN (Minimum Recall) - the parameter causes the controller to place a call for vehicle service on the phase. The phase is timed at least for its minimum green, regardless of whether there is a vehicle detection event on the movement.

MAX (Maximum Recall) - the parameter causes the controller to place a continuous call for vehicle service on the phase, which results in displaying the green indication for its maximum duration every cycle.

RRED (Rest Red) - When actuation is set to "rest red" the signal will remain red until an approaching vehicle is detected. The first approaching vehicle detected will send a command to the controller and that phase will become active. If an approaching vehicle is detected by another traffic sensor, that phase will be put in queue until the active phase is complete. Once all phases are complete and no further phases are in queue, all phases will remain red until a vehicle is detected.

RGRN (Rest Green) - When actuation is set to "rest green" it will remain green following actuation and expiry of the green time, while the other phase will remain red until a vehicle is detected. If an approaching vehicle is then detected by another traffic sensor, that phase will be put in queue until the active phase has reached the minimum green time and no vehicles are in queue or has reached the maximum green time, regardless of vehicles being in queue. The phase with the vehicle in queue will become active and will remain green until a vehicle is detected by a traffic sensor assigned to another phase.

• **LOCKING** – Enables the controller to remember or hold a vehicle call (even after the calling vehicle leaves the detection area) until satisfied by the appropriate green indication.

Yellow Lock – The controller "remembers" vehicle actuations that occur during the yellow and red display of the signal phase. When the controller determines if the phase should be called for service, it uses the remembered actuations to call the phase to service, even if the detected vehicle has since left.

Non-Lock – The controller does not remember actuations and the phase will be called to service only if it has a currently occupied detector area.

The following options are only available if a pedestrian display is connected to the corresponding unit:

- **WALK** The time in seconds the walking man will be actuated.
- **DON'T WALK F (FLASHING)** The time in seconds the red hand will be flashing.
- **PED RECALL** options are ON or '-' (nil). If set to 'ON', the start of the pedestrian green (walk indication) coincides with the start of green for the coinciding vehicle through movement. If set to '-' (nil), then the pedestrian green (walk indication) will only be made active by a pedestrian actuation event (push button activated), putting the phase into queue for service.

Repeat the previous instructions to edit phases 1-8 as required.

CLEAR SETTINGS - to clear all settings associated to a phase (timing inputs, movements, assigned units, etc.), navigate to and open the phase. Select CLEAR SETTINGS. A prompt will appear, to proceed with clearing all the data, press ENTER on the controller. To exit without clearing the settings, press BACK. Clearing the settings will only erase settings associated to that phase. It will not affect any existing time of day settings.



8.4 Time of Day and Day of Week Operations

It may be a requirement to control traffic differently at different times of the day, or days of the week. Perhaps 6:00AM - 8:00AM is busier than 2:00PM or maybe the weekend sees less traffic on a certain side road.

Directly above the phase chart are two tabs. Use the directional arrow buttons to move the cursor to select these tabs. The large tab allows the user to edit the days of the week (up to 4 combinations of days) and the small tab allows the editing of the time of day - specifically the start time (8 per day).

Note: Before using TIME OF DAY and DAY OF WEEK settings, be sure the internal clock is set to the correct time and date. See SECTION 6.4 DATE & TIME.

DAY OF THE WEEK

Pressing ENTER with the large tab selected will open the SELECT DAYS TO OPERATE PLAN menu.



Use the direction buttons to move the white cursor. Each position on the horizontal indicates a dedicated day of the week on a specific tab (notice 4 tabs can be created). Press ENTER on a selected day and use the UP and DOWN buttons to turn the day on or off for a specific tab. Notice that the letter indicates the day of the week and that the day is activated (ON).

Note: Sunday is indicated by a 'U' and Thursday is indicated by and 'R'.

Once the desired days of the week are activated, press the BACK button to save and close. Notice on the PHASE SETTINGS screen the tabs are now populated according to the chart.

It is now possible to edit individual phase parameters per selected days of the week and time of day. The tab will remain white if its parameters are selected for editing.

TIME OF DAY

Pressing ENTER with the small tab selected will open a SET START TIME screen. Move the white cursor with the LEFT/RIGHT arrows and use the UP and DOWN buttons to edit the start time, to the nearest 10 minutes. This time indicates the time of day in which the timing or options for a specific phase will change to the new values.



Press BACK or ENTER to save and close. Notice a tab appears with the selected start time. Create additional start times as required. Note that two start times are required to have any affect.

It is now possible to edit individual phase parameters (MAX GREEN, RED, etc.) per selected time of day. Use the directional buttons to move the cursor to the desired day(s) of week tab and appropriate start time tab and then move the cursor down to edit the corresponding timing and phase parameters. The selected time of day will remain white while its phase parameters are being edited.

Example:

Phase parameters set for 2:20PM will take affect from 2:20PM to 8:50PM.

Phase parameters set for 8:50PM will take affect 8:50PM to 2:20PM of the following day.

COMBINING DAY OF WEEK AND TIME OF DAY

In the following example the Phase 2 MAX GREEN time is being changed to 5 seconds to be in affect from 8:50PM to 2:20PM on the weekend (SAT-SUN).

MON-FRI SAT-SUN					
2:20PM 8:5	50PM	-			
PHASES	1	2			
MIN GREEN					
MAX GREEN		5 🛟			
YELLOW					
RED					
PASSAGE					

Note that each day (or combination of days) of the week can contain multiple time of day tabs.

8.5 Operating Advanced Mode

Starting and monitoring an ADVANCED mode setup is similar to BASIC, but with some key differences.

First navigate to the HOME screen.

Next, go to WORK ZONE SETUP then PHASE SETTINGS.

Select VIEW/EDIT PLAN NUMBER and cycle

through the plans. Locate the required plan. To edit or change a plan, refer to sections 8.3 and 8.4.

On the opposite side of the screen, cycle through the ACTIVE PLAN NUMBER to select the plan to be operated.

Navigate back to the home screen. When all required Secondary Units are connected, press START PROGRAM. When the program has started, use the arrows to navigate to the PHZ tab at the bottom of the HOME screen. Press ENTER to view the PHASE STATUS screen.

STARTED OPERATING FINE		FINE				FEB/01/17 09:53AM PROGRAM: MODEL V##			
BATTERY UNIT: PI	: 24.0 VO RIMARY	DLTS	RADIO C	HOME > P IO CHANNEL: 03 RADIO SIGNAL		ME > PHZ SIGNAL:	STATUS		
PHAS	SE STAT	rus							
			RING	G 1		RING 2			
PLAN	N		1			1			
CURRENT PHASE		1			5 🕓				
TIME			12			12			
NEXT	PHASE		2			6			
PHASES IN QUEUE		3,	4		7,8				
PRI	SEC1	SEC2	SEC3					PHZ	

Within the PHASE STATUS SCREEN the following information can be viewed:

- PLAN The plan being run.
- CURRENT PHASE (Per associated Ring)
- TIME Timing for current phase.
- NEXT PHASE Next phase(s) to be served.
- PHASES IN QUEUE Phases that are in the plan, or phases that are actuated and are awaiting service.

In addition to the phase status screen, cycling through the PRI and SEC# tabs will provide machine specific diagnostic information.

8.6 Example Setup

Scenario: A standard intersection with left turn and through signals on the North-South bound movements. West-East bound sees heavier traffic volumes during the weekdays from 6:00AM to 9:00AM and from 4:20PM to 7:10PM. There are vehicle detectors on the WEST- EAST bound approaches.

- 1. Choose the Plan to edit (1-10).
- 2. Set Phase 1 to NORTH-WEST to create a left turn phase for the North bound movement. Assign unit Primary: Head B, R-Y-G.
- 3. Set Phase 2 to SOUTH and assign Secondary 1: Head A, R-Y-G.
- 4. Assign Barrier A to Phase 2 (automatically applies the barrier to Phase 6 as well).
- 5. Set Phase 3 to WEST and assign Secondary 2: Head A and Head B, both as R-Y-G. Assign actuation Sensor 32 as POS+.
- 6. Assign Barrier B to Phase 3 (automatically applies the barrier to Phase 7 as well).
- 7. Set Phase 5 to SOUTH-EAST and assign it to Secondary 1: Head B, R-Y-G.
- 8. Set Phase 6 to NORTH and assign it to Primary: Head A, R-Y-G.
- 9. Set Phase 7 to EAST and assign it to Secondary 3: Head A and Head B, both as R-Y-G. Assign actuation Sensor 32 as POS+.
- 10. Create a DAY OF THE WEEK tab for both the weekend (SAT-SUN) and weekdays (MON-FRI).



- 11. Create TIME OF DAY tabs for 6:00AM, 9:00AM, 4:20PM, and 7:10PM in the weekday tab.
- 12. Input the required timing and parameters for all phases, for each time of day change that is assigned to each day (or grouping of days).

Note: For actuated phases 3 and 7:

- input both MIN and MAX GREEN times
- input PASSAGE time
- Select a CALL parameter (typically RRED, 'rest red')
- Select a LOCKING type (typically YEL, 'yellow lock')

When the steps have been followed correctly, the programmed NEMA Diagram should appear like the diagram below.



9 COMPATIBILITY MODE

The Gen 3 CU has the capability of interfacing and operating with North America Traffic's previous generations of traffic signal controllers, known as Gen 1 and Gen 2.



If operating Gen 3 with previous generations of control units (CU), a few rules apply:

- Only one generation of CU can be operated with the Gen 3 system at any given time (i.e. Gen 3 with Gen 1, or Gen 3 with Gen 2). Operating Gen 1 and Gen 2 together is <u>not possible</u>.
- A Gen 3 CU **must** always be the PRIMARY unit within the network.
- The Gen 3 unit can only operate in BASIC mode when operating with Gen 1 or Gen 2 units.

Be aware that not all Gen 3 functions are available when operating in compatibility mode. Differences and limitations of compatibility mode are outlined below:

	Function:	GEN 1	GEN 2	GEN 3
Max quantity of secondary units		5	7	
Radio channel quantity		10 (0-9)	10 (0-9) 7 (0-6)	
Emergency Vehi	cle Preemption	× √ √		\checkmark
Railroad Preemption		×	\checkmark	\checkmark
Video Detection		×	\checkmark	\checkmark
Auto-restart Functions	Communication Regain	\checkmark	\checkmark	\checkmark
	From Dead Battery State	\checkmark	\checkmark	\checkmark
	From Blackout	\checkmark	\checkmark	\checkmark

9.1 Setting Compatibility Mode on Gen 3

As with all generations of CU, all the secondary units to be used in the network should be:

- Powered before the primary unit
- Proper unit ID assigned (refer to SECTION 9.2 OPERATING WITH GEN 1 for designation of proper unit ID's based on the generation of CU)
- Set to the same radio channel

Refer to the specific unit's user field guide for instruction on setting the above.

- 1. Ensure all secondary units are powered, assigned the proper unit ID, and set to the correct radio channel.
- 2. Proceed to the Gen 3 unit and from the home screen select WORK ZONE SETUP.
- 3. Set the UNIT ID to PRIMARY.
- 4. Set the RADIO CHANNEL to the same as all other secondary units in the network.
- 5. From the home screen, select OPTIONS and scroll down until COMPATIBILITY is visible.
- 6. Set COMPATIBILITY to the required mode of compatibility (either GEN 1 or GEN 2).
- 7. Ensure LEVEL OF OPERATION is set to BASIC.
- Refer to SECTION 7 SETTING UP A WORK ZONE for detailed information on selecting the proper CONTROL MODE, LAYOUT, TIMING and OPTIONS settings (all timing and settings for all secondary units across the network are input/set at the Gen 3 primary unit).

Note: Other Gen 3 units can be intermixed in the network (i.e. A ONE-WAY, 1 SIDE is selected – requires the PRI to be Gen 3 CU, the SEC1 can be a Gen 3 CU and the SEC2 a Gen 2 CU).

9.2 Operating With Gen 1

Gen 3 models PTL 2.4x, PTL 2.4LD and TTS 3.7 will operate with Gen 1 units using program versions 1-9, 1-10 or 2-10. It is important to note a single GEN 3 unit can be operated in compatibility mode with Gen1. You cannot use additional Gen 3 units.

Due to the software structure of the Gen 1 system, unit ID's are not alike (or interchangeable) between the Gen 3 and Gen 1. For example, Gen 1 uses the unit ID of SECONDARY PHASE 1B and Gen 3 uses the equivalent unit ID of SECONDARY 1. This unit ID structure has a bearing on which Gen 1 unit ID's are assigned, based on the layout selected at the Gen 3 primary unit. Refer to the chart below to determine which Gen 1 secondary unit ID's are required, per the selected layout.

GEN 3 SETUP		GEN 1 Secondary Unit ID's				
SITE LAYOUT	Pri	S1B	S2A	S2B	S3A	S3B
ONE-WAY ZONE	1	2				
ONE-WAY 1 SIDE	1	2	3			
ONE-WAY 2 SIDE	1	2	3		4	
ONE-WAY 3 SIDE	1					
ONE-WAY 4 SIDE	1					
ONE-WAY 5 SIDE	1					
ONE-WAY 6 SIDE	1					
ONE-WAY 1 CROSS ROAD	1	2	3	3		
ONE-WAY 1 CROSS 1 SIDE	1	2	3	3	4	
ONE-WAY 1 CROSS 2 SIDE	1					
ONE-WAY 2 CROSS ROADS	1	2	3	3	4	4
ONE-WAY 2 CROSS 1 SIDE	1					
ONE-WAY 2 CROSS 2 SIDE	1					
TWO-WAY ZONE (MANUAL MODE)	1	1				
TWO-WAY 1 SIDE ROAD	1	1	2			
TWO-WAY 1 CROSS ROAD	1	1	2	2		
TWO-WAY 2 SIDE ROADS	1	1	2		3	
TWO-WAY 2 CROSS ROADS	1	1	2	2	3	3
TWO-WAY 3 SIDE	1					
TWO-WAY 4 SIDE	1					

Note: The numbered boxes indicate the assigned phase (i.e. 1 = phase 1, 2 = phase 2)

Note: The Gen 3 primary CU alters its radio protocol when operating in Gen 1 compatibility mode. This may require the user to force a re-write of the radio channel on the Gen 3 radio modem. This can be accomplished by ensuring the correct radio channel is set on the Gen 3 CU, then completing a power off/ on cycle. This will establish communication between the Gen 3 CU and all associated Gen 1 CU's.

Section 9

9.3 Operating with Gen 2

The Gen 2 and Gen 3 share similar software structures when it comes to unit ID's and work zone layouts. Refer to the chart below for further detail when setting up the Gen 2 secondary units.

GEN 3 SETUP				GEN 2 S	Secondary L	Jnit ID's		
SITE LAYOUT	Pri	S1	S2	S3	S4	S5	S6*	S7*
ONE-WAY ZONE	1	2						
ONE-WAY 1 SIDE	1	2	3		_			
ONE-WAY 2 SIDE	1	2	3	4		_		
ONE-WAY 3 SIDE	1	2	3	4	5		_	
ONE-WAY 4 SIDE	1	2	3	4	5	6		_
ONE-WAY 5 SIDE	1	2	3	4	5	6	7	
ONE-WAY 6 SIDE	1	2	3	4	5	6	7	8
ONE-WAY 1 CROSS ROAD	1	2	3	3				
ONE-WAY 1 CROSS 1 SIDE	1	2	3	3	4			
ONE-WAY 1 CROSS 2 SIDE	1	2	3	3	4	5		
ONE-WAY 2 CROSS ROADS	1	2	3	3	4	4		_
ONE-WAY 2 CROSS 1 SIDE	1	2	3	3	4	4	5	
ONE-WAY 2 CROSS 2 SIDE	1	2	3	3	4	4	5	6
TWO-WAY ZONE (MANUAL MODE)	1	1						
TWO-WAY 1 SIDE ROAD	1	1	2					
TWO-WAY 1 CROSS ROAD	1	1	2	2				
TWO-WAY 2 SIDE ROADS	1	1	2	3				
TWO-WAY 2 CROSS ROADS	1	1	2	2	3	3		
TWO-WAY 3 SIDE	1	1	2	3	4			
TWO-WAY 4 SIDE	1	1	2	3	4	5		

Note: The numbered boxes indicate the assigned phase (i.e. 1 = phase 1, 2 = phase 2)

*Gen 2 unit ID's of SEC6 and SEC7 will require the software version V28. Previous program versions only have SEC ID's up to SEC5.

10 DATA MANAGEMENT

10.1 FAULT/DATA LOGS

The FAULT LOGS records both systems faults, as well as operational data. 10,000 events are held in memory for viewing on-screen or by means of export to a spread sheet file format.

Note: to see full list of s	ystem fault messages, see	SECTION 15 TROUBLESHOOTING

DEFAULT FLASH RED PRESS START TO RESUME		FEB/01/17 09:53AM PROGRAM: MODEL V##
BATTERY: UNIT: PRI	24.0 VOLTS IMARY RADIO CH	HOME > OPTIONS 1 > FAULT LOGS HANNEL: 03 RADIO SIGNAL:
CLEAR I	FAULT	PREV PAGE
	FAU	JLT LOGS
LINE	DATE	EVENT
0	JAN-13-17 8:50AM	COMMUNICATION REGAIN
1	JAN-13-17 8:47AM	COMMUNICATION LOSS
2	JAN-12-17 12:22PM	LAMP FAULT CLEARED
3	JAN-12-17 12:18PM	LAMP FAULT
4	JAN-10-17 5:37PM	COMMUNICATION REGAIN
5	JAN-8-17 12:18PM	LAMP FAULT
6	JAN-8-17 5:37PM	COMMUNICATION REGAIN
EXPORT LOGS	FAULT	NEXT PAGE

- Timing changes during operation
- Software import/exports
- Export of Data Logs

Exporting Logs:

- 1. From the FAULT LOGS screen select EXPORT FAULT LOGS.
- 2. A prompt will appear to insert the USB flash drive.
- 3. Press EXPORT FAULT LOGS.
- 4. The following screen will be displayed.



5. Remove USB flash drive after the Export Status pop-up window disappears.

Note: The exported file type is a .csv (named "NATLogs") and can be viewed in any spreadsheet software.

The Data Log records:

- Daily battery voltage at noon and midnight
- System power on
- Program start with existing distance setting
- Moving from one battery threshold into another that isn't a fault (i.e. 23.7V to "low state" of 23.6V)
- Preemption Events
 - System forced actuation calls
- Hold for railroad events

10.2 System Status and Diagnostics



Using the \leftarrow and \leftarrow directional buttons from the HOME screen will allow you to view the PHASE STATUS and DIAGNOSTIC screens for each unit in the network. Press ENTER to view the selected tab.

Diagnostic Screen:



Status of Lamps – graphic displays the active lamp.

Basic Unit Diagnostic:

- Battery voltage
- Activation Queue: checked if vehicle detection event is present
- Pre-empt Queue: checked if preemption event is present

MALFUNCTION MANAGEMENT SYSTEM – the MMS runs through its systems checks and the checked items confirm there are no issues.

Phase Status:



CURRENT PHASE – displays which unit(s) is being served by the current phase.

TIME – indicates how many seconds are remaining for the corresponding signal indication.

NEXT PHASE – indicates which unit will be served by the following phase.

PHASES IN QUEUE – displays which units will be served following the unit listed in "NEXT PHASE".

10.3 Software Import/Export

Software updates and preprogrammed traffic plans can be imported via USB flash drive. Exporting can be used to save plans or for transfer of plans to other controllers. This will save all program settings to the USB flash drive.

- 1. From the OPTIONS menu, select SOFTWARE IMPORT/EXPORT. Following the prompt on screen, insert the USB flash drive.
- 2. Select START IMPORT or START EXPORT when ready.
- 3. Prompt to enter the system passcode will appear. Enter the passcode (see Section 5.3 System Passcode).
- 4. Pop-up status window will appear and notify when the export/import in complete.
- 5. Remove the USB flash drive.

11 Optional Equipment

11.1 RADIO REMOTE

The radio remote does not have an on/off switch. Pressing and holding any button will turn the radio on. The radio will automatically turn off after releasing a button. The radio frequency range is 910 MHz - 917 MHz (spread spectrum, frequency hopping) and operates at less than 1 watt of power. There is no FCC license required and the radio complies with all FCC regulations.

Radio Remote Push Buttons:

There are three buttons located at the top of the remote, a Red, Green, and Black button. Upon pressing any button an LED light near the button will light up confirming a valid command has been received by the PTL 2.4x. You must press and hold the button for 3 seconds until the LED illuminates.

Radio Remote Push Button Functions:

(Automatic Mode)

- Pressing the Red button initiates an ALL STOP command.
- Pressing the Green button resumes system operation after an ALL STOP condition <u>at the Primary</u> <u>signal.</u>
- Pressing the Black button resumes system operation after an ALL STOP condition <u>at the Secondary</u> <u>signal.</u>

Radio Remote Push Buttons Functions:

(Manual Mode)

- Pressing the Red button initiates ALL STOP.
- Pressing the Green button will turn the Primary signal green.
- Pressing the Black button will turn the secondary signal green.
- An ALL STOP must be performed prior to changing green signal.

Note:

- a. Keep the remote control in the nylon case at all times in case it is dropped.
- b. Keep remote control dry at all times to prevent water damage.
- c. Keep 4 spare AA batteries on hand at all times.

Radio Remote Power supply:

The radio remote control is powered by 4 AA batteries which will last up to several months, depending on usage.

Weak Battery Indicator:

A chirping sound indicates the remote batteries are dead when a button is pressed.

Setting the Radio Channel:

Note: Setting the radio channel of the remote can be done at either the Primary or Secondary unit.

- 1. From the OPTIONS menu, select SYNC RADIO REMOTE.
- 2. Pressing and holding the like black and like red buttons at the same time after selecting SYNC RADIO REMOTE on the controller will configure the controller radio channel to the radio remote.
- 3. A prompt will appear that will inform the user when sync is complete.



Generations of Radio Remote:



	Compatible with systems:			Channel Set Method	Qty. of
Radio Remote Type:	Gen 1	Gen 2	Gen 3	Channel Set Wethod	Channels
1/4 Watt (WHITE-WHITE)	\checkmark			Dip Switches	7
1 Watt (BLACK-WHITE)	\checkmark	\checkmark	\checkmark	Dip Switches	7
1 Watt REV1 (BLACK-WHITE)	\checkmark	\checkmark	\checkmark	Dip Switches	10
1 Watt (BLACK-BLUE)	\checkmark	\checkmark	\checkmark	Sync to Gen 3 controller	10

11.2 VEHICLE DETECTION

MTS

The microwave traffic sensor will identify a vehicle moving in its detection area and then trigger the operation of the traffic controller. The device will provide accurate and consistent vehicle detection that is not affected by temperature, humidity, color, or background variations.



Range shown at maximum - not drawn to scale



The MTS can be set to trigger the controller when the traffic approaches or when it departs. The range and delay can also be adjusted.

Video

The TrafiCam sensor is used for detection and monitoring of moving and stationary vehicles at signalized intersections. Vehicle presence information is transmitted to the traffic controller via detection outputs so that the timing can be adjusted dynamically. Therefore, vehicle waiting time is reduced and traffic flows are optimized. There are up to eight (8) direction sensitive vehicle presence detection zones.

Video Camera Hardware Specifications:

		Angle of View			
Version	Focal Distance	Vertical	Horizontal	Corner to Corner	Detection Area
Narrow Angle	8 mm	22°	32°	39°	15 to 75m (45-250 ft)

11.3 Remote Monitoring Services (RMS)

Two forms of RMS are offered:

- Cellular based
- Satellite based

Both forms of RMS require external hardware to be interfaced with the Gen 3 controller. They also both provide the end user with the same system fault information:

- Communication Failure
- Conflict between signals
- Lamp Fault
- Other (i.e. low and dead battery status, damage to controller hardware)

The RMS systems allow for asset location tracking and geofencing via a secured website (a geofence is a virtual barrier which is set in the GPS software). The battery bank voltage can also be remotely monitored.

	Cellular	Satellite	
Communication Method & Coverage	 Communicates from the portable traffic signal (PTS) to the end user through the cellular network Limited to areas of cellular coverage 	 Communicates from the PTS to the end user through connection to orbiting satellites Communication anywhere in the world where the PTS is deployed 	
Fault Message Delivery	 Text messages (4 max) Email (4 max) 	 Text messages* (unlimited) Email (unlimited) *End user must have 'email to text' capability through their cellular carrier 	
Web Based User Interface	 User can login to view: Current operating status (on/off and battery voltage at that PTS) Physical location of the PTS Activity log of on/off and fault events 		
Theft Prevention (Geo-Fencing)	- User can set up desired radius; if the PTS is moved outside the designat- ed area, the user is notified by text or email		

11.4 Emergency Vehicle Preemption

Both forms of emergency vehicle preemption (EVP) listed below provide priority to the signal controller at which the detection event occurs. Any conflicting phases displaying green are immediately terminated. After which, the corresponding red clearance interval is served and the approaching emergency vehicle is given a green indication. This green indication is held as long as the EVP detection is present. Once the EVP detection is no longer present, traffic control resumes, as programmed. Both forms of EVP detection can be equipped with a 4 inch (10.16 cm), flashing white floodlight. This serves to notify emergency vehicles of detection and that priority has been placed on their approach.

Strobe Detection

The emergency vehicle uses a special strobe light to transmit a continuously flashing optical signal. The detector receives this signal, and if the signal format is correct, it will notify the traffic controller of a request for priority.

Audible Detection

The audible detector can detect 'Class A' sirens (Yelp, Wail, Hi-Lo) of an approaching emergency vehicle and the direction from which they are approaching. It will notify the traffic controller of a request for priority.

11.5 INTERSECTION INTERFACE

This hardware serves as an interface to permit connection of the PTL 2.4x to a 110 VAC intersection controller. This allows the 110 VAC controller to operate the signal lamps on the PTL 2.4x. This requires a hardwire connection from the intersection controller to the PTL 2.4x unit(s).

11.6 DIRECTIONAL ANTENNA

The directional antenna is intended for use in long distance work zones, and/or work zones varying in elevation (i.e. **Pilot Car** work zones). This antenna has an operational range up to 7 miles (11.3 km) with line of site. The directional antenna can easily replace the standard omni-directional whip antenna, and vice versa.

12 COMMUNICATIONS

12.1 RADIO SYSTEM

Best Practices:

- Operate with strong radio signal strength. At least 50% strength consistently (see Systems Tray).
- Operate within 1/2 mile (0.8 km) apart including line of site (if using the standard omni-directional antenna).

Common Interference:

- Anything that interrupts line of sight between the units. i.e. tractor trailers, bridges, heavy equipment, elevation changes.
- Anywhere there is large amounts of rock exposed causes interference.
- Anything in the area containing a lot of structural steel.
- Close proximity to radio stations, airports, and power lines.

Dip Switch Settings:

1 Watt Radio Module



12.2 HARDWIRE

Where it is required:

- Weak RSSI signal strength. Less than 50% consistently (see Systems Tray).
- No line of sight. i.e. inside a parking garage, tunnels, across large steel bridges, under an overpass.

Cable Requirements:

- Minimum Cable Specification: Single twisted pair with a ground and braided wire; shielded. 22 AWG conductor size. Max length of 4000 ft. (1219 m) and/or 4 splices.
- Recommended Cable: Belden Cable 3106A Multi-conductor.
- Cable may need to cross roadway overhead, by saw cuts in the road, or through a culvert.
- An alternative to these would be a cable protector channel.

13 Power System Information

13.1 Solar

The PTL 2.4x has a solar array consisting of four (4), 100 Watt solar panels, for a total collection of 400 Watts. The solar array is regulated by a 20 amp regulator. The solar array provides only supplemental charge to the battery bank and does not allow for infinite operation. Charging the battery bank by means of 120 VAC source may be required every 24 to 30 days (temperature will have an influence on this. Refer to SECTION 13.2 BATTERIES).

Deployment

In order for the solar array to be effective, it requires maximum exposure to the sun. The PTL 2.4x is equipped with a solar array that can rotate 360° and tilt 0° to 60° on the vertical plane.

Importance of Sun Exposure

Shade and even dust has a significant impact on solar collection. Roughly 5% coverage of the solar array almost completely negates the solar panel's current output. Steps should be taken to minimize shading of the panel, if possible.

Cleaning

The accumulation of dirt, debris, and snow will significantly hinder the solar arrays capability to provide charge to the batteries. It is recommended that the solar array be inspected on a daily basis to ensure it is free of dirt and debris. Should the array require cleaning, use water and a mild soap and wipe clean. Do not use harsh chemicals, shovels, rakes, or any other metal tool to clean debris from the solar array, as damage to the glass may occur. Use a car snow brush or broom to remove snow or other large debris.

13.2 BATTERIES

The PTL 2.4x battery bank is comprised of wet cell (lead acid), 6 volt batteries, wired for a 24 volt power supply. This model comes equipped with either a 12 or 16 battery configuration. As an option, sealed lead acid (AGM) batteries are available.

Autonomy

The autonomy of the battery bank is defined as how many continuous days (24 hour period) the units will operate the signal lamps and controller hardware for without receiving any recharge aid from the solar array (in the absence of sunlight). The autonomy for the battery configuration is:

Flooded Lead Acid (FLA):

16 batteries: 30 days of continuous operation

12 batteries: 24 days of continuous operation

Sealed Lead Acid (AGM):

16 batteries: 28 days of continuous operation

12 batteries: 22 days of continuous operation

Note: The above autonomy ratings are based on fully charged, maintained batteries (as per the manufacturer's guidelines), operating at a temperature of 21° Celsius or 72° Fahrenheit.

Factors that affect battery autonomy are:

Temperature

Extreme temperatures (both high and low) can dramatically affect battery autonomy and charging.

High

Heat increases water usage and can result in overcharging and depletion of water, leading to damage. Batteries naturally discharge at temperatures above 49° Celsius (120° Fahrenheit). Batteries require less time to charge in high temperatures, which can result in rapid over-charging and damage to the batteries.

Low

Discharging batteries at low temperatures make the batteries susceptible to freezing due to the depletion of acid within the battery as it discharges. Batteries require a longer period of time to charge in cold temperatures.

Batteries should be operated (discharged) in the temperature range of -29° to +49° Celsius (-20° to +120° Fahrenheit). Batteries discharged below 0° Celsius (32° Fahrenheit) should be charged immediately, to avoid freezing.

The min and max temperatures in which charging should occur is between -18° to +49° Celsius (0° to +120° Fahrenheit).

Over Discharge

Lead acid batteries are 'non-memory' and over-discharge will cause damage and premature battery failure. To avoid over-discharge, the PTL 2.4x notifies the user of low battery voltage (23.6 Volts or less) by emitting a continual beep and displaying the message 'CHARGE FOR 24 to 48 HOURS' on the screen.

Inactivity

Lead acid batteries that are not in use will slowly discharge over time, possibly leading to over-discharge and damage to the batteries. If the batteries will be inactive for a long period of time (EXAMPLE: sitting over the winter months), then the charger should be plugged in periodically or ensure the solar panels have good exposure to the sun and are free of debris.

Low Battery Notification and Charging

The signal controller will notify the user that charging is required when the battery bank voltage reaches 23.6 Volts. The notification consists of continuous beeping emitted from the controller hardware and a message on the controller of 'CHARGE FOR 24 to 48 HOURS'. Connection to a 120 VAC source for a minimum of 24 hours is required to bring the battery bank back to a full charge. If using a generator, refer to SECTION 13.4 GENERATOR Use for instruction.

Note: Intermittent charging for short periods of time will not provide adequate charge to the battery bank. A continuous charge for a minimum of 24 hours is required.

Battery Threshold states:

Low - 23.6 Normal operation continues, but system warns user to charge the batteries for 24 to 48 hours.

Dead - 23.0 Operation is terminated and system enter default mode behavior. Charging message displayed on the controller.

Blackout - 21.0 Lamp indications are terminated and go dark. Radio communications continue within the network and controller interface remains operable.

13.3 CHARGER

The battery charger is used to recharge the batteries by means of connection to a 120 VAC power source (wall outlet or generator). The PTL 2.4x has a 40 Amp charger with a maximum power output of 960 Watts (at 24 VDC).

The charger plug (for connection to the 120 VAC source) is located at the base of the control cabinet door and can be accessed without the need to open the control cabinet (refer to SECTION 13.4 GENERATOR USE if using a generator).

Note: Always ensure that the power cable used to connect to the battery charger is the correct gauge, in good working condition and properly grounded.

13.4 GENERATOR USE

A minimum 1200 Watt generator is required to meet the power requirements of the battery charger.

Connection and Operation

ACAUTION Never start up the generator while connected to the battery charger. This may lead to damage and/or failure of the battery charger.

Generators can output high voltage spikes upon initial startup. To protect the battery charger from such voltage spikes, allow the generator to run for a few minutes after initial startup, then make the connection to the battery charger.

Note: Always ensure that the power cable used to connect to the battery charger is the correct gauge, in good working condition and properly grounded.

14 GENERAL MAINTENANCE Please refer to website for latest maintenance forms.

Please refer to website for latest maintenan

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14.1 TRAILER MAINTENANCE SCHEDULE

Performing routine maintenance on your Portable Traffic Signal is critical to ensuring safety while in tow, as well as the longevity of the trailer and its components. The items below are critical components that should be inspected on a monthly basis.

Inspection of Tires:

• Tread depth should be inspected for signs of wear, refer to tire manufacturer for recommendation.

Tire Pressure:

• Use a pressure gauge to make sure your tires are inflated to 50 psi.

Tire Condition and Age:

- Inspect the tread and sidewalls for any cuts, scrapes, punctures, bulges, bumps or cracks. Replace tire if there is visible damage.
- The age of the tires should always be noted and considered. Tires that are six years old should be replaced. To determine the tire's age, refer to the DOT stamping on the sidewall. The date code is the last four digits at the end of the DOT stamping. The first two numbers are the week and the last two are the year. For example, 4617 indicates that the tire was manufactured the 46th week of 2017.

Proper Torque of Lug Nuts:

• Ensure the lug nuts are torqued on a monthly basis. Use a torque wrench. The wheel lug nuts should be torqued to **120 ft/ lbs**.

Note: The lug nuts are torqued to spec at the factory. Check and re-torque after the first 10 miles (16 km), 25 miles (40 km), and again at 50 miles (80 km) of travel. This should also be done after every wheel removal. Continue to check the torque of the lug nuts on a monthly basis thereafter.

Check Axle Grease:

- It is important to regularly inspect the quality and quantity of grease within the axle hub cap. There is no disassembly required. The procedure to replace axle grease is as follows:
 - 1. Jack the trailer up to lift the wheels.
 - 2. Remove the rubber plug from the end of the grease cap.
 - 3. Place a standard manual grease gun on the grease fitting.
 - 4. While rotating the wheel, slowly pump grease into the fitting. The old, displaced grease will flow out of the cap around the grease gun nozzle. When clean grease is observed, remove the grease gun. Wipe off excess grease and replace the rubber grease cap.

Check Axle Bolts for Proper Torque:

• Perform this inspection on a monthly basis - along with torquing of the tire's lug nuts. The axle mounting bolts should be torqued to **150 ft/ lbs.**

Inspection of Trailer Components:

- a. Check Tongue Hitch Coupler: Routinely check that the tongue hitch coupler is torqued to 45 ft/lbs.
- **b.** Check Hitch Coupler Components: Check the hitch coupler components to ensure the latch has full range of motion. Ensure the coupler locks on the ball without movement or play. If loose, tighten the adjusting nut as required (Please contact North America Traffic for Instructions).
- c. Inspect All Locking Pins for Excessive Wear or Damage.
- d. Inspect the Tongue/ Draw Bar for Any Signs of Damage.
- e. Test the Running Lights for Proper Function: Inspect the electrical contacts in all plugs and receptacles for signs of wear or corrosion. Replace and components, as required.
- f. Safety Chain Inspection: Inspect safety chain for any breaks, wear, damage. Replace as necessary.
- g. Tire Rotation: Inspect the tires for wear and rotate every 9,600 to 12,800 miles (15,450 km to 20,600 km).

15 troubleshooting

Message	Description	Cause	Solution
CHECK SETTINGS THEN PRESS START	Primary unit is ready to op- erate	Machine(s) running properly	Press "Start" button on Primary when ready to start program
CYCLE PAUSED	While running automatic cycle	User has paused the cycle (all red) with the hand held remote	Press the green button on HHR when ready to start program
TURN ON SECONDARY UNIT "X"	The Primary unit is waiting for communications from the Secondary "x" after the power is turned on	Secondary "x" is not turned on Secondary "x" is on, radio channel is different then pri- mary unit Secondary "x" is on, radio cable is not attached to trans- mittor Secondary "x" is on, radio dip switches have been changed Secondary "x" is on, antenna has been damaged Secondary "x" is on, radio cable has been damaged	Turn on Secondary "x" Change radio channel on Sec- ondary "x" to match Primary Attach radio cable to radio to radio transmittor Set the dip switches as per diagram (see Section 12.1) Replace antenna Replace radio cable
TURN ON PRIMARY UNIT	Secondary waiting for commu- nications to start after power is turned on	Primary is not turned on Primary is on, radio channel is different than Secondary "x" Primary is on, radio cable is not attached to transmittor Primary is on, radio dip switches have been changed Primary is on, antenna has been damaged Primary is on, radio cable has been damaged	Turn on Primary Change radio channel on Secondary"x" to the same as Primary Attach radio cable to radio transmittor Set the dip switches as per diagram Replace antenna Replace radio cable
COMMUNICATION OK PRESS START TO RESUME	Primary unit sees good communication from all en- abled Secondary units	Machine(s) running properly	Press "Start" button on Primary when ready to start program
COMMUNICATION FAILED SEE PRIMARY UNIT	Secondary unit sees a radio communication failure	Go to Primary and refer to "REPAIR COMMUNICATION"	

Message	Description	Cause	Solution
REPAIR COMMUNICATION	Communication failure is seen by the primary unit	Primary and Secondary "x" are too far apart Primary and Secondary "x" do not have line of sight Primary and Secondary "x" lost communication due to temporary loss of line of sight, i.e. slow moving transport truck between signals	Move machines closer or use hardwired connection Move machines to achieve line of sight or use hardwired connection Increase drop out time (see Section 6.4) Enable COMMUNICATION REGAIN (see 6.4)
		Radio channel is changed on one signal only	Change other signal(s) to same radio channel
		Radio dip switches have been changed Radio cable is not attached to the transmittor Radio cable has been dam- aged Radio interferance	Set the dip switches as per diagram (see Section 12.1) Attach radio cable to radio transmittor Replace radio cable Change radio channel on all signals up or down one channel. Ensure all singals are changed to the same channel
PROBLEM DETECTED ON LAMP: X REPAIR MACHINE	Current overload (short circuit) or underload (open circuit) lamp outputs	Faulty wire connection Faulty wires Faulty lamp Faulty controller	Check connections and recon- nect wiring Check wires, replace where necessary Replace faulty lamp Replace faulty controller
MALFUNCTION RESPONSE REPAIR MACHINE	Undiagnosed MMU fault	Call 877-352-4626	Call 877-352-4626
ATTENTION: SEE PRIMARY UNIT	Secondary sees a problem with the Primary unit	Problem with Primary signal	Go to Primary signal to view error
ATTENTION: SEE SECONDARY UNIT "x"	Primary sees a problem with Secondary unit "x"	Problem with Secondary "x" signal	Go to Secondary "x" signal to view error
DEFAULT FLASH RED	Default flashing, as shown on Secondary machine	Previous fault has cleared automatically Machine Failure	Press "START" button on Primary when ready to start program See Primary unit for instruc- tion
DEFAULT FLASH RED PRESS START TO RESUME	Default flashing, as shown on Primary machine	Previous fault has cleared automatically Machine Failure	Press "START" button on Primary when ready to start program See Primary unit for instruc- tion

Message	Description	Cause	Solution
ALL STOP	System is in "all red", Secondary unit	All stop has been triggered by radio remote or "ALL STOP" button on the Primary or Sec- ondary controller	Press "START" button on Primary, when ready to start program Press "RESUME PROGRAM" at the Secondary unit at which the ALL STOP was conducted
ALL STOP PRESS START TO RESUME	System is in a red state at all units	All stop has been triggered by preemption, radio remote or "ALL STOP" button on con- troller	Press "START" button on Primary, when ready to start program
STARTED OPERATING FINE	Normal operation, as shown on Primary machine	Signal is operating within normal parameters	
OPERATING FINE	Normal operation, as shown on Secondary machine	Signal is operating within normal parameters	
BATTERY LOW CHARGE FOR 48 HRS	Battery bank voltage is read- ing low	Battery charge is below 23.6V, machine will still operate	Plug internal charger into 110V power source for min- imum 24hrs of continuous charging
MALFUNCTION RESPONSE BATTERY DEAD CHARGE FOR 48 HRS	MMU detected that the bat- tery is too low to operate	Battery charge is below 23.0V, machine will not operate	Plug internal charger into 110V power source for min- imum 48hrs of continuous charging
MACHINE FAULT CHECK RS- 485 WIRING	Communications timeout on the RS-485 network	TFR hardware is present, but has been disabled in the software Wiring harness to controller	OPTIONS PG 4 > FACTORY SETTINGS > TFR HARDWARE > ENABLE Replace faulty harness
		from MMU or TFR faulty	
		Wiring Splice between TFR harness and CU harness is disconnected	Check splices in wire duct under CU
		MMU link is broken	Check unit diagnostic tab, check for MMU link (checked box)
		TFR failure	Check status LED's on TFR Replace TFR
		Controller failure	Replace controller
CHANGING	Machines are changing states (between default flashing, default all stop, operating)		

Message	Description	Cause	Solution
MALFUNCTION RESPONSE NO LAMPS (DARK) REPAIR	MMU detected that no lamps were displayed	All LED lamps not connected	Connect LED lamps
MACHINE		Faulty controller	Replace controller
MALFUNCTION RESPONSE CHECK LAMP WIRING	MMU detected a timing fault on a lamp circuit	LED lamp(s) not connected	Connect LED lamp(s)
REPAIR MACHINE		Faulty controller	Replace controller
MALFUNCTION RESPONSE CONFLICTING LAMPS	MMU detected a conflicting lamp output	Short circuit in wiring	Check and replace faulty wiring
REPAIR MACHINE		LED lamps connected to wrong terminal	Check wiring diagram and terminal block
DEFAULT ALL RED PRESS START TO RESUME	Default solid red, as shown on Primary machine	Previous fault has cleared automatically	Press "START" button on Primary, when ready to start program
DEFAULT ALL RED	Default solid red, as shown on Secondary machine	Previous fault has cleared automatically	Press "START" button on Primary, when ready to start program
HOLD FOR RAILROAD	While running automatic cycle, system has paused for railroad preemption (all red)	Signals are operating within normal parameters	Automatic cycle will restart once the system is told the railroad is clear
DEFAULT FLASHER PRESS START TO RESUME	When primary unit is first powered	Post-power up	Press START PROGRAM

16 PARTS LIST

Part Name	Part Number
Gen 3 Controller	500-0676
Gen 3 TFR	500-0677
J1 Harness	400-0212
J2 Harness	400-0213
J3 Harness	400-0214
6 Position Fuse Block	500-0355
40A 24V Battery Charger	500-0730
6V Battery	500-0149
24V Solar Panel (Dasol)	500-0782
20A Regulator	500-0674
T-Handle Latch	500-0168
K4 Actuator (24.5") - Light Post	500-1144
K2 Actuator (44") - Mast Arm	500-1145
Radio Cable (RJ12)	400-0151
Adapter DSUB 9POS male to	400-0150
RJ12 (Adapter for cable to radio)	
1 Watt Radio Transceiver	500-0092
10.375" Antenna Coupler Cable	400-0209
24" Antenna Coupler Cable	400-0152
7dB Whip Antenna	500-0003
Antenna Base Plane Station	400-0146
PolyCase Radio Enclosure	400-0201
PolyCase Plate Kit	400-0202
12" Red LED Lamp	500-0691
12" Yellow LED Lamp	500-0692
12" Green LED Lamp	500-0693
12" Ball Cap Visor (Yellow/Black)	MISC
4" Back Lamp (24V)	500-0737
4" Back Lamp grommet	500-0083
4" Back Lamp pigtail	400-0133
12"x12"x12" Back Board (Yellow)	500-0015
12"x12"x12" Back Board (Black)	500-0013
Abus Lock	500-0001
Running Light Kit	400-0272
Tire ST205/75R15	500-1129
Aluminum Fender	100-0017
3" wide 2" Ball Coupler	500-0236
2" Ball/Pintle Hook Combo	500-0234