BÖWE BELL+HOWELL

MAILMOBILE

MAILMOBILE 4
PACKMOBILE 4
PROGRAMMER'S GUIDE
For Advanced Vehicles

TP50655 ISSUE 06/03

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We have tried to ensure that the information is accurate, complete and readily usable.

This document was created with pride by Böwe Bell & Howell Technical Communications. This document provides vital information required to operate and maintain your Böwe Bell & Howell equipment.

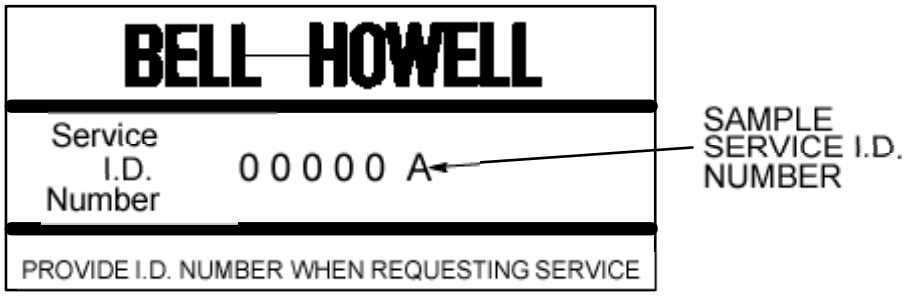
This document contains input from many sources. We want to thank all who contributed to the creation of this document.

WARNING

Böwe Bell & Howell machines are supplied with certain safety instructions or devices. Safety instructions are found in printed material attached to the machine and in the operator manual; safety devices include start-up safe guards, interlock switches and emergency stop devices. Böwe Bell & Howell strongly urges that all machines be operated with these devices as supplied. Owners and operators of Böwe Bell & Howell equipment should take time to: (1) read and understand the operator manual, (2) become familiar with the functioning of the equipment before attempting to use it in regular production, (3) carefully observe all precautions listed in the operator manual or noted on the equipment and (4) observe good manufacturing safety practices whether or not contained in this manual. Failure to do so may cause serious personal injury or property damage.

SERVICE CALLS

Dial 1-800-792-4782 should your Böwe Bell & Howell machine require service. Remember to provide your service I.D. number when calling.



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1. INTRODUCTION

1.1 THE MAILMOBILE AND PACKMOBILE SYSTEM

The Mailmobile and Packmobile system provides a method for safe and efficient transfer of goods throughout your facility. Your Mailmobile system includes one or more Mailmobile or Packmobile vehicles, the guidepath, accessories, and the Route Manager.

- ***Mailmobile or Packmobile:*** The vehicle that carries the goods within your facility. The Mailmobile has individual bins for each destination, while the Packmobile has shelving for large parcels.
- ***Guidepath:*** A non-hazardous fluorescent chemical strip applied to the floor. The Mailmobile or Packmobile follows the guidepath.
- ***Accessories:*** Items that customize the vehicle system for your facility, such as package shelves, mail restraints, annunciators, etc.
- ***Route Manager:*** The brains of the vehicle, which allows you to customize the vehicle to change routes, board elevators and perform other functions required to deliver goods in your facility.

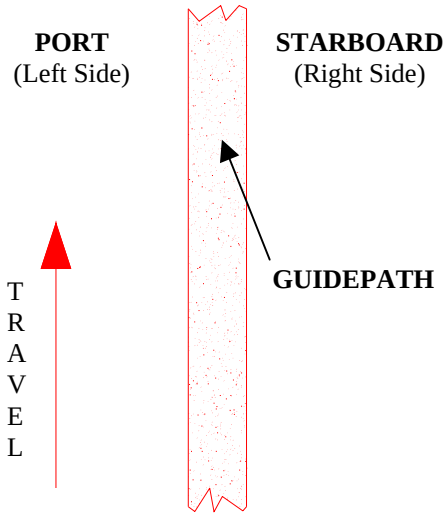
1.2 THE PROGRAMMER'S GUIDE

The *Programmer's Guide* is a user's manual intended for those who operate and program a Mailmobile 4 or Packmobile 4 system equipped with the Route Manager.

Before learning how to program a vehicle, it is important to be familiar with the operation of the vehicle, to have read the *Key Operator Manual*, and to have attended a key operator training session.

1.3 CONVENTIONS USED

1. To avoid confusion when referring to a particular side of the guidepath, we will use the nautical terms port and starboard.



- ***Port.*** The left side when facing the direction of vehicle travel.
- ***Starboard.*** The right side when facing the direction of vehicle travel.

2. This manual uses the term "Mailmobile" to refer to the vehicle and its accessories as a whole.

3. The keypad display is shown in a shadowed box.

R01_S001_E001

4. The keys to be pressed are shown in bold type inside a box; a sequence will show several keys in a row.

Enter

5. Variables are shown in bold italic type inside a shaded box. Limits for the entry are included.

password, 000000-999999

2. THE ROUTE MANAGER

2.1 WHAT THE ROUTE MANAGER DOES

The Route Manager is a keypad and display unit attached to the front control panel of the Mailmobile or Packmobile. Its primary function is to convert the facility blueprint and route map into electronic signals in the vehicle computer's memory. Why? So that daily task lists can be easily changed without altering the guidepath and so that the vehicle can travel automatically where there is no guidepath.

During the process of designing and installing a system, the facility blueprint is converted into four data tables used to program the Route Manager:

- *Branch Table*–lists the direction to take at each branch intersection to get from one location to another.
- *Location Table*–lists where the vehicle is to perform a function along the path.
- *Action Table*–lists the specific action to be taken when the vehicle gets to the proper location.
- *Route Table*–lists the step-by-step sequence of functions to be performed by the vehicle during a delivery run.

In order to understand how the facility blueprint is converted to these tables, it is necessary to define several terms:

- *L-code*–floor code applied adjacent to the guidepath that acts as a landmark.
- *Action*–special function to be performed by the vehicle as it travels along the guidepath.
- *Action Code*–numeric representation of the action, used to program the Route Manager.
- *Location*–place along the guidepath where an action occurs with reference to the last L-code passed.
- *Event*–an action occurring at a specific location.
- *Route*–sequence of events.
- *Step*–one of the events in a route.
- *Map*–branch table, location table, and action table together.

2.2 MAP AND ROUTE DESIGN

The design of a system using the Route Manager is a combined effort of the Böwe Bell & Howell Sales, Böwe Bell & Howell Service and the key operator.

Planning: Böwe Bell & Howell Sales

1. Mark delivery points (events) on blueprint.
2. Design a path that combines least distance, good wall clearance, and plenty of room for people, while passing all delivery points.
3. Add any branches that would make the route more efficient and identify the potential routes.
4. Mark other locations (events) where the vehicle performs a special function (action), such as “open doors”, “slow down”, “radio transmit to remote annunciators” and “signal elevator”.

Installation: Böwe Bell & Howell Service

1. Number events and identify landmarks (L-codes) on the blueprint.
2. Install the guidepath and L-codes.
3. Convert the blueprint into data tables for programming the vehicle:
   a. Prepare the action table to link action codes to events.
   b. Measure the distance from L-codes to each event and prepare the location table, linking locations to events.
   c. Prepare the branch table defining the routing to take to get from each L-code to every other L-code on the guidepath. **Note: A Branch Table is required *only* if routes have no events between L-Codes.**
   d. Prepare a route table for each route, linking a sequence of events together as steps.
4. Program the vehicle using the Route Manager.
5. Alter the tables and program when the guidepath is changed.

Daily operation: key operator

1. Select a route on which to dispatch the vehicle.
2. Alter the action table, location table and route table(s) when delivery needs change.

This process is illustrated by an example in the following section.

2.3 EXAMPLE

Using the Route Manager is analogous to sending a courier around your facility to deliver your goods. First, you train the courier so they know how to get around and where to make deliveries (branch table, location table, action table). Second, you give the courier items to deliver and a list of which deliveries to make (route table).

The following is a step-by-step account of how you would convert the blueprint and delivery maps into the route data required in the vehicle's memory.

The example uses many of the terms defined in Section 2.1 and the Glossary. Refer to those sections if you need additional explanation.

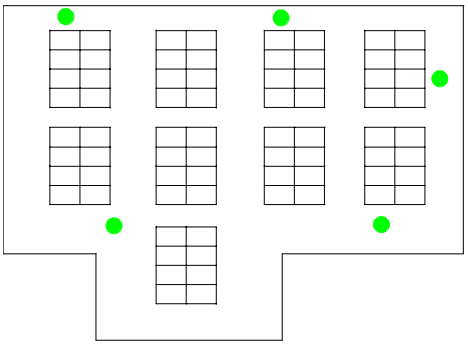
2.3.1 PLANNING: BÖWE BELL & HOWELL SALES

1. Mark delivery points (events) on blueprint.

= Offices

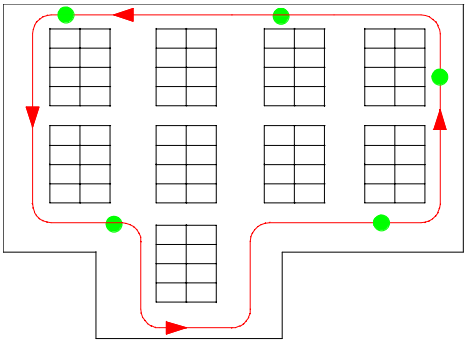
= Walls

= Event (delivery point)

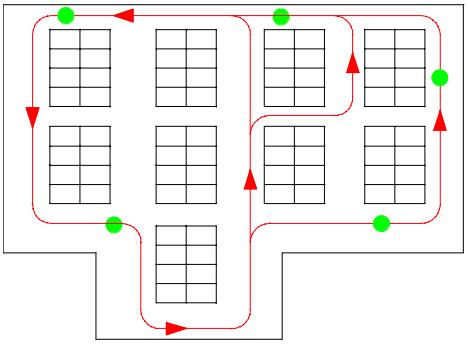


2. Draw a path that combines least distance, good wall clearance and plenty of room for people, while passing all delivery points.

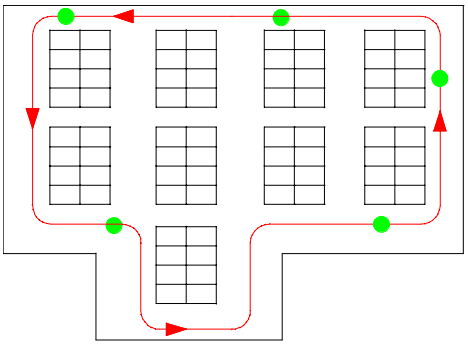
= Guidepath and direction



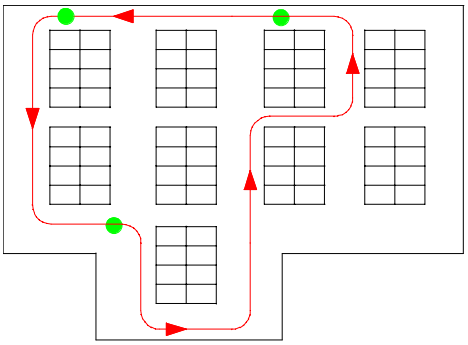
3. Identify and add any branches that would make the route more efficient.



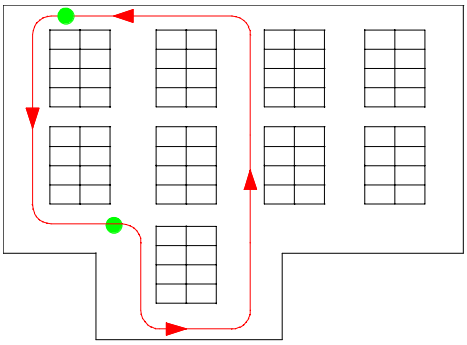
Route 1: Delivery to 5 points.



Route 2: Delivery to 3 points.

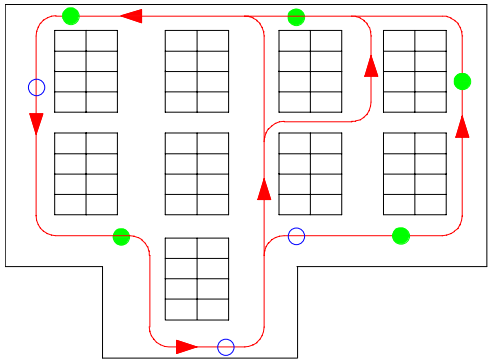


Route 3: Delivery to 2 points.



4. Mark other locations (events) where the vehicle performs a special function (action).

   = Event (not delivery point)



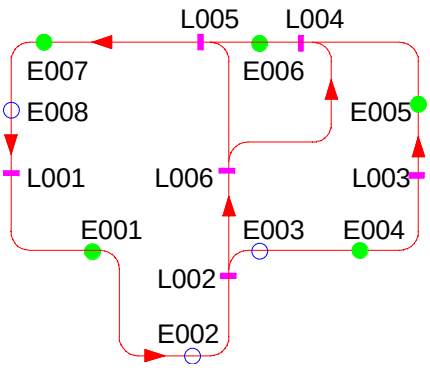
5. Mark the blueprint with the specific action at each event. For example, “temp stop with tone for 20 seconds” or “caution stop”.

2.3.2 INSTALLATION: BÖWE BELL & HOWELL SERVICE

1. Number the important locations along the guidepath.

   = L-code

   a. Position L-codes at critical places along each route.
   b. Number the L-codes.
   c. Number the Events.
   d. List the action for each event.



2. Install the guidepath and L-codes.

3. Prepare the action table:

   a. List the events in order.
   b. Assign the action code for each event.
   c. List parameters P1 and P2 for each action.

EVENT	ACTION	P1	P2
E001	A01	0	20
E002	A11	-	-
E003	A05	-	-
E004	A01	0	20
E005	A02	0	10
E006	A02	0	30
E007	A01	0	20
E008	A03	-	-

4. Prepare the location table:

   a. List the events in order.
   b. List the L-code immediately preceding each event.
   c. List the direction if there is a branch at the L-code.
   d. Measure and list the distance to each event from the L-code.

EVENT	L-CODE	DIR	DIST
E001	L001	L	35.0
E002	L001	L	60.6
E003	L002	R	6.8
E004	L002	R	25.2
E005	L003	L	15.4
E006	L004	L	5.7
E007	L005	L	40.2
E008	L005	L	74.6

5. Prepare the branch table:

   a. List the L-codes that precede branches as “from” L-codes.
   b. For each branching L-code, list all other L-codes on the route as “to” L-codes.
   c. Fill in the table with the desired direction of travel at the branch.

   Hint: *The default direction is left. Thus, the table only needs to list the right branches.*

FROM	TO	DIR
L002	L003	R
L002	L004	R
L006	L004	R

6. Prepare the route table:

   a. List the events, in order, which make up each route.
   b. Number each line as a step.
   c. The last event in the list must be E000

   Note: If routes are to be linked, do not end the route with E000. Use an event that points to action code 34.

ROUTE	STEP	EVENT
R01	S001	E001
R01	S002	E002
R01	S003	E003
R01	S004	E004
R01	S005	E005
R01	S006	E006
R01	S007	E007
R01	S008	E008
R01	S009	E000
R02	S001	E001
R02	S002	E002
R02	S003	E006
R02	S004	E007
R02	S005	E008
R02	S006	E000
R03	S001	E001
R03	S002	E002
R03	S003	E007
R03	S004	E008
R03	S005	E000

7. Program the vehicle using the Route Manager and test the program.

8. Alter the tables and program when the guidepath is changed.

2.3.3 DAILY OPERATION: KEY OPERATOR

1. Select a route on which to dispatch the vehicle.

2. Alter the action table, location table and route tables when delivery needs change.

3. CONVERTING THE BLUEPRINT TO DATA TABLES

The end result of system design is a blueprint with routes and events marked. In order for the vehicle to follow the routes and perform the events, the blueprint information must be entered into the vehicle's memory through the Route Manager.

The following chapter gives a step-by-step procedure for making the conversion, using the same example introduced in Chapter 2.

3.1 PLACING L-CODES

L-codes are reference points along the guidepath, which enable the vehicle to locate the position of events.

PROCEDURE:

1 Place L-codes along the guidepath:

- wherever the vehicle is likely to be started.
- immediately prior to each branch and after each merge.
- before any events where position is critical.
- after any off-path maneuvers, prior to the next event.
- typically not more than 200 to 300 feet from the furthest event.

2 Number the L-codes:

- starting with L001 for the first L-code along the path.
- using L002-L255 at branches.
- using L002-L511 along the guidepath with no branch.
- using each L-code only once along the guidepath.

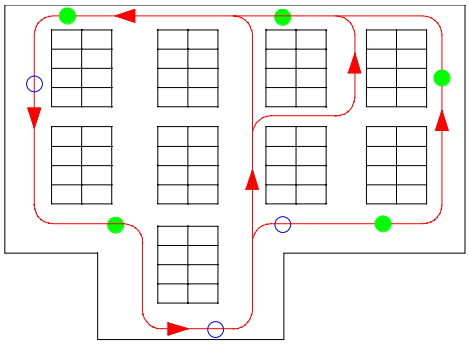
NOTES:

- L-codes L256-L511 cannot be used before branches.
- L-codes with high numbers are harder to install than those with low numbers because they are larger. Unless the guidepath is very complex, use L-codes with the lowest numbers possible.

EXAMPLE:

Required Information:

Blueprint of guidepath with events marked and listed.



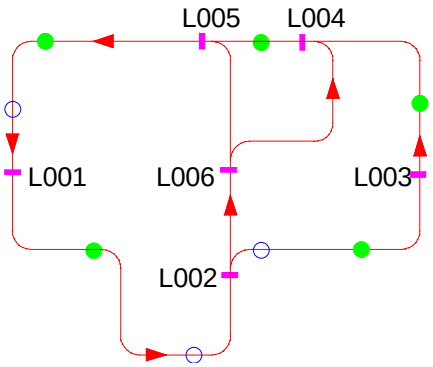
Procedure:

Place L-codes along the guidepath at critical locations and number them:

- L001 is placed at the start of the path.
- L002 and L006 are placed before branches.
- L004 and L005 are placed after merges.
- L003 is placed before an event where position is critical.

Result:

L-codes are placed on the guidepath as shown:



3.2 NUMBERING EVENTS

Events are the action taken at a specific location along the route.

PROCEDURE:

1 Number the events:

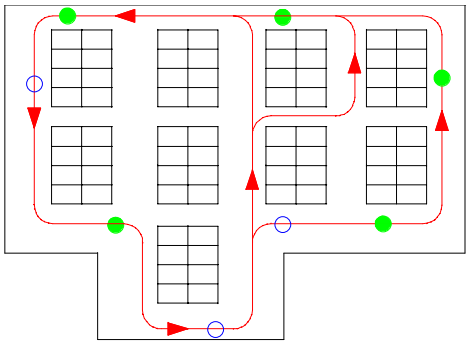
- starting with E001
- with range E001-E999

2 List the action to take place at each event. Refer to Appendix A for a list of available actions.

EXAMPLE:

Required Information:

Blueprint of guidepath with events marked and listed.

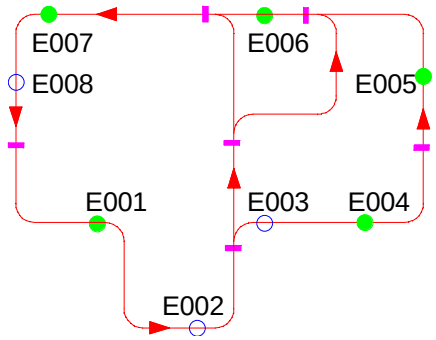


Procedure:

Number the Events and list the Action at each. E001 is the first event along the path with additional events numbered sequentially.

Result:

Diagram of guidepath showing event numbers and descriptions.



EVENT	DESCRIPTION
E001	Temp stop with tone, 20 sec
E002	Caution stop
E003	Radio Transmit, Code 00
E004	Temp stop with tone, 20 sec
E005	Temp stop without tone, 10 sec
E006	Temp stop without tone, 30 sec
E007	Temp stop with tone, 20 sec
E008	Permanent stop

3.3 PREPARING THE ACTION TABLE

The action table lists the action code for each event.

PROCEDURE:

1 List the events in order. There is a maximum of 999 events.

2 Assign the action code for each event.

- One action code can be used for many events.
- Appendix A lists the action codes.

3 List parameter 1 and parameter 2 for each action code.

- Appendix A lists the parameters.
- Not all action codes have parameters.

NOTES:

- If you change the guidepath, you may need to revise the action and location tables.

EXAMPLE:

Required Information:

List of events occurring along the path

EVENT	DESCRIPTION
E001	Temp stop with tone, 20 sec
E002	Caution stop
E003	Radio Transmit, Code 00
E004	Temp stop with tone, 20 sec
E005	Temp stop without tone, 10 sec
E006	Temp stop without tone, 30 sec
E007	Temp stop with tone, 20 sec
E008	Permanent stop

Procedure:

List the events in order:

- Events range from E001 to E008.

Assign the action code for each event:

- For E001, Appendix A shows action code A01 for "temp stop with tone"

List parameter 1 and parameter 2 for each action code:

- For A01, Appendix A shows that parameter 1 is minutes, in this case 0
- For A01, Appendix A shows that parameter 2 is seconds, in this case 20

Resulting Information:

ACTION TABLE

Event	Action Code	Parameter 1	Parameter 2
E001	A01	0	20
E002	A11	-	-
E003	A05	-	-
E004	A01	0	20
E005	A02	0	10
E006	A02	0	30
E007	A01	0	20
E008	A03		

NOTES:

- You can set the default temp stop time for any temp stop (defined in Mode 9, Function 5) by entering 0 at both parameter1 and parameter 2. For temp stops using other times, enter the time values as shown above.

3.4 PREPARING THE LOCATION TABLE

The location table lists the position of each event relative to the preceding L-code.

PROCEDURE:

1 List the events in order.

- There is a maximum of 999 Events.
- This list must be the same as the one in the action table.

2 List the L-code immediately preceding each event.

- One L-code can be used for many events.

3 List the direction if there is a branch between the L-code and event.

- R = right, L = left.
- If there is no branch, the direction can be right or left. However, all events based on that L-code must have the same direction.

4 Measure and list the distance to each event from the reference L-code.

- The Route Manager can be used to display the distance in the diagnostic information mode. See Appendix B, Diagnostic Information, for instructions on displaying distance.
- If the event occurs at the L-code, the distance is 0 feet, 0 inches. However, if a stop is to occur at an L-code place it at least 12 inches past the L-code to allow the vehicle room to make a smooth stop.
- If more than one event occurs at the same location, space them one inch apart.

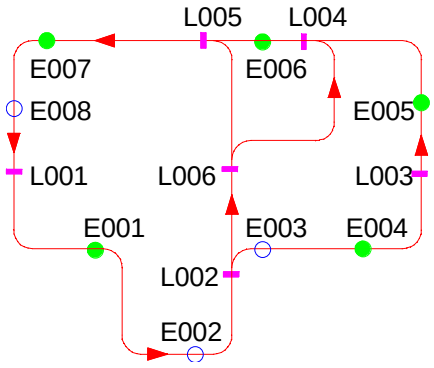
NOTES:

- If you change the guidepath, you may need to revise the action and location tables.

EXAMPLE:

Required Information:

Guidepath diagram showing L-codes and events.



Procedure:

List the Events in order:

- Events range from E001 to E008.

List the L-code immediately preceding each event:

- For E001, the preceding L-code is L001.
- For E003, the preceding L-code is L002.

List the direction if there is a branch between the L-code and event:

- For E001, there is no branch, so the default direction left is used.
- For E003, the branch direction is right.

Measure and record the distance from the L-code to each event:

- For E001, the distance is 35 feet, 0 inches.
- For E003, the distance is 6 feet, 8 inches.

Resulting Information:

LOCATION TABLE

Event	From L-code	Direction	Distance
E001	L001	L	35.0
E002	L001	L	60.6
E003	L002	R	6.8
E004	L002	R	25.2
E005	L003	L	15.4
E006	L004	L	5.7
E007	L005	L	40.2
E008	L005	L	74.6

3.5 PREPARING THE BRANCH TABLE

The branch table lists the desired branch direction to travel from one L-code to the next when there are no events in between.

PROCEDURE:

1 List the L-codes that immediately precede branches as “from” L-codes.

- Branches can occur only after L-codes 1-255.
- Branches cannot occur after L-codes 256-511.

2 For each branching L-code, list all other L-codes on the route as “to” L-codes.

- Range L001-L511.

3 Fill in the table with the possible directions to travel from the “from” L-code to the “to” L-code.

- R = right, L = left.

4 If both right and left are possible, choose the best direction. The default branch direction is left. When choosing a direction, consider:

- traffic
- distance
- people
- noise
- wear

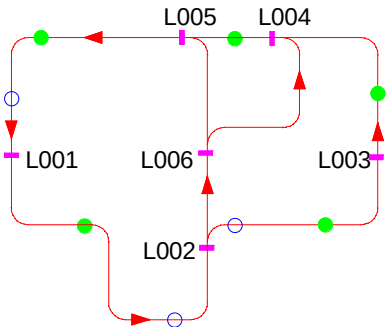
NOTES:

- If you change the guidepath, you may need to revise the branch table.
- List only the right branches in the branch table, since left is default.

EXAMPLE:

Required Information:

Guidepath diagram showing L-codes.



Procedure:

List the "from" L-codes that immediately precede branches:

- L002 and L006 immediately precede branches.

List all other L-codes as "to" L-codes:

- For L002, this includes all L-codes except L002.
- For L006, this includes all L-codes except L006.

List the possible branch directions to get from one L-code to the others:

- Either direction leads from L002 to L001.
- Only the right branch leads from L002 to L003.

Decide the "best" direction between L-codes:

- From L002 to L001, the left branch is shorter.

Resulting Information:

BRANCH TABLE

From L-code	To L-code	Direction	Possible
L002	L001	L	R or L
L002	L003	R	R
L002	L004	L	R or L
L002	L005	L	R or L
L002	L006	L	L
L006	L001	L	R or L
L006	L002	L	R or L
L006	L003	L	R or L
L006	L004	R	R
L006	L005	L	R or L

3.6 PREPARING THE ROUTE TABLE

The route table lists the events to be performed sequentially along each route.

PROCEDURE:

1 List the events, in order, which occur along each route marked on the blueprint and which are necessary to the task.

- An event can be used more than once in a route.
- Events can be used in any route, all routes, or no route at all.

2 Number each line as a step in the route.

- In each route there is a maximum of 345 steps.
- There is a maximum of 20 routes.
- Step numbers range from S001 to S345.

3 The last event in the list must be E000.

- Travel along a route typically terminates with a permanent stop action or function code.
- Events listed after E000 will not be executed.

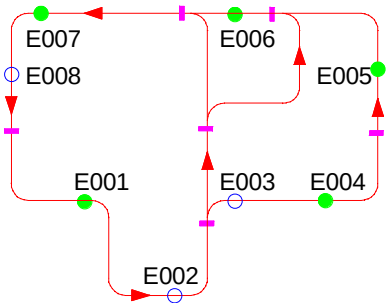
NOTES:

- Guidepath changes may or may not necessitate changes to the route table.
- The steps in a route are performed in order. If the last event before E000 is not a permanent stop, the route repeats from the beginning without stopping.

EXAMPLE:

Required Information:

Guidepath diagram showing events.



Procedure:

List the Events in order which occur along each route:

- Route 1 includes events E001 to E008.

Sequentially number each event as a step:

- For route 1, E001 is step 001.

The last event in the list must be E000:

- The last step of route 1, S009, is E000.

Resulting Information:

ROUTE TABLE

Route	Step	Event
R01	S001	E001
R01	S002	E002
R01	S003	E003
R01	S004	E004
R01	S005	E005
R01	S006	E006
R01	S007	E007
R01	S008	E008
R01	S009	E000
R02	S001	E001
R02	S002	E002
R02	S003	E006
R02	S004	E007
R02	S005	E008
R02	S006	E000
R03	S001	E001
R03	S002	E002
R03	S003	E007
R03	S004	E008
R03	S005	E000

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4. PROGRAMMING PROCEDURES

There are 9 different programming tasks accessible through the Route Manager. These tasks are called “modes”. Modes 0, 1 and 8 are always available; the others are protected by a password to limit access.

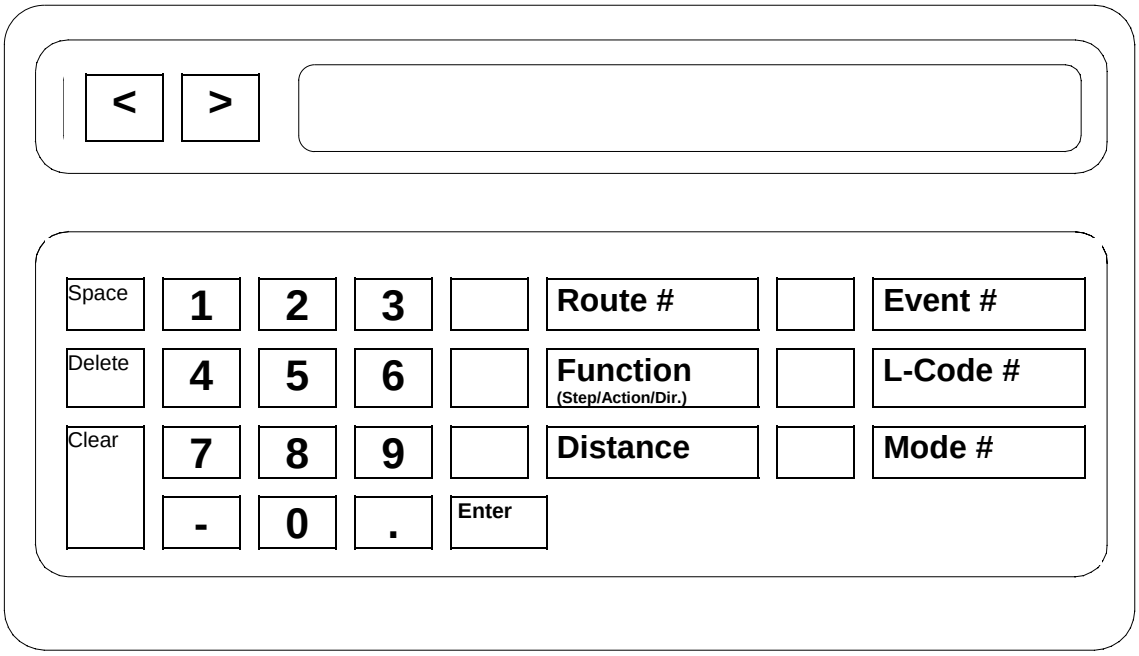
The following modes are available through the Route Manager:

Mode 0	**Help**	Displays the modes and their names.
Mode 1	**Run Route**	Allows you to select and run a route for daily operation.
Mode 2	**Edit Route Table**	Allows you to create or change a route.
Mode 3	**Copy Route**	Allows you to copy an existing route to create a new one.
Mode 4	**Edit Location Table**	Allows you to define and edit the locations of events.
Mode 5	**Edit Branch Table**	Allows you to define and edit the branch table. Where you define how the vehicle travels from one L-code to another.
Mode 6	**Edit Action Table**	Allows you to define and edit the action table.
Mode 7	**Sync**	Not used.
Mode 8	**Display Information**	Displays diagnostic information. The vehicle will run in this mode as well as Mode 1.
Mode 9	**Configuration**	Allows you to configure operation of the vehicle to your facility.

The use of the keys on the Route Manager is described below.

4.1 THE ROUTE MANAGER KEYPAD

The Route Manager is the keypad/display unit on the front of the vehicle. It allows you to program it and display diagnostic information.



- **Scroll Keys (<) and (>)**

  Cause the display to scroll back and forth through the information shown.

- **Space**

  Moves the cursor ahead one position, creating a space on the display.

- **Delete**

  Moves the cursor backward one position, removing the previous character on the display.

- **Clear**

  Deletes everything presently shown on the display.

- **Number Keys (0-9)**

  Allows entry of numeric information and identification numbers.

- **Dash (-)**

  Scrolls the display backward through information in certain modes. Also used when deleting steps from a route table.

- **Decimal (.)**

  Enters a decimal point for numeric information and scrolls the display forward through information in certain modes. Also used to insert steps into a route table.

- **Enter**

  Sends information from the display to the vehicle's central processor. Also clears the display after errors.

- **Route #**

  Prepares the Route Manager for entry of a specific route.

- **Function**

  Prepares the Route Manager for entry of a specific step, action code, or direction depending on the present mode.

- **Distance**

  Prepares the Route Manager for entry of a distance from a L-code.

- **Event #**

  Prepares the Route Manager for entry of a specific event.

- **L-Code #**

  Prepares the Route Manager for entry of a specific L-code.

- **Mode #**

  Prepares the Route Manager for entry of a specific mode or a password.

4.2 PASSWORD ACCESS

Some functions are password protected to prevent accidental changes during normal daily operation.

PROCEDURE:

1 Enter the password.

Mode # | *password, 000000-999999* | Enter

- If you entered the correct password, the display shows:

Hit<Enter>, Access On.

- If you did ***not*** enter the correct password, the display shows:

Hit<Enter>, Err:Mxx 0-9.

2 Exit the password mode.

Enter

EXAMPLE:

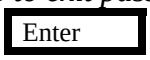
Task

Access a protected mode by entering the password 123456.

Key sequence to enter password

Display

Key sequence to exit password mode



4.3 MODE 1: HOW TO SELECT A ROUTE

A route is a series of events the vehicle performs in a specific sequence.

PROCEDURE:

1 Enter route select mode.

Mode # | 1 | Enter

2 Select the new route number.

Route # | *route, 1-20* | Enter

3 If starting at a step other than 1, choose the step.

Function | *step, 1-345* | Enter

- To go to the ***next*** step:

  Enter

- To go to the ***previous*** step:

  – | Enter

NOTES:

- The vehicle must be in mode 1 or mode 8 to operate.
- When in mode 1, the Route Manager displays the next step and event the vehicle is programmed to perform.
- After completing a route, the sequence resets to step 1.
- If the selected step is event 0, the vehicle will not start.
- When the vehicle is started, it proceeds first to the chosen step in the route, then finishes the remaining steps.

EXAMPLE:

Task

Select route 1 as the current route.

Key sequence to begin select mode

Mode #	1	Enter

Key sequence to select a route

Route #	1	Enter

Display

R01_Step001_E001

4.4 MODE 2: HOW TO EDIT A ROUTE TABLE

The route table is the internal database listing the events to perform along all routes.

PROCEDURE:

1 Enter password following the procedure in Section 4.2.

2 Enter route edit mode.

Mode #	2	Enter

3 Edit the route.

Enter the route number to edit.

Route #	*route, 1-20*	Enter

4 Enter the step to edit.

Function	*step, 1-345*	Enter

a. Enter the event.

- To ***insert*** an event:

Event #	*event, 1-999*	•	Enter

- To ***delete*** an event:

Event #	*event, 1-999*	–	Enter

5 To continue building a table, repeat step 4 until finished.

- To go to the ***next*** step:

Enter

- To go to the ***previous*** step:

–	Enter

NOTES:

- This procedure must be done in order.

EXAMPLE:

Task

Assign step 1 of route 1 to event 1 (from the location table and action table).

Route table

Route	Step	Event
01	001	001

Key sequence to begin edit mode

[Mode #] [2] [Enter]

Key sequence to insert a step

a. Enter the route number to edit.

[Route #] [1] [Enter]

b. Enter the step to edit.

[Function] [1] [Enter]

c. Insert the event.

[Event #] [1] [•] [Enter]

Display

R01_Step001_E001

4.5 MODE 3: HOW TO COPY AN EXISTING ROUTE

To simplify data entry, similar routes can be edited by copying from an existing route.

PROCEDURE:

1 Enter password following the procedure in Section 4.2.

2 Choose new route.

a. Enter route edit mode

Mode #	2	Enter

b. Choose a number for the new route you want to copy ***to***.

Route #	*route, 1-20*	Enter

3 Choose existing route.

a. Enter route copy mode.

Mode #	3	Enter

b. Choose the existing route you want to copy ***from***.

Route #	*route, 1-20*	Enter

NOTES:

- This procedure must be done in order.
- Using route 0 as the route to copy ***from*** clears all information in the new route.
- If the copy ***to*** route is an existing route, it will be overwritten.

EXAMPLE:

Task

Copy route 2 to route 4.

Key sequence to choose new route

a. Enter route edit mode.

Mode #	2	Enter

b. Choose a number for the new route you want to copy ***to***.

Route #	0	4	Enter

Key sequence to copy existing route

a. Enter route copy mode.

Mode #	3	Enter

b. Choose the existing route you want to copy ***from***.

Route #	0	2	Enter

Display

Copy R02 to R04

4.6 MODE 4: HOW TO EDIT A LOCATION TABLE

The location table is the internal database that lists where events are in relation to the L-codes.

PROCEDURE:

1 Enter password following the procedure in Section 4.2.

2 Enter location table edit mode.

[Mode #] [4] [Enter]

3 Edit the location table.

a. Enter the event to edit.

[Event #] [*event, 1-999*] [Enter]

b. Enter the reference L-code.

[L-Code #] [*L-code, 1-511*] [Enter]

c. Enter the branch direction (0 = left, 1 = right).

[Function] [*branch, 0-1*] [Enter]

d. Enter the distance from the reference L-code.

[Distance] [*feet, 0-999*] [•] [*inches, 0-11*] [Enter]

4 To continue building a table, repeat step 3 until finished.

- To go to the ***next*** event:

[Enter]

- To go to the ***previous*** event:

[–] [Enter]

NOTES:

- Steps 3b, 3c, and 3d can be done in any order.
- If there is no branch between the L-code and the event, the direction can be right or left, but must be the same direction as other events based on that L-code.

EXAMPLE:

Task

Enter location of event 1. Event 1 is located after passing L-code 1 by branching left and traveling 35 feet, 0 inches.

Location table

Event	From L-code	Direction	Distance
001	001	L	35.0

Key sequence to begin edit mode

Mode # | 4 | Enter

Key sequence to enter data

a. Enter the event to edit.

Event # | 1 | Enter

b. Enter the reference L-code.

L-Code # | 1 | Enter

c. Enter the branch direction (0 = left, 1 = right).

Function | 0 | Enter

d. Enter the distance from the reference L-code.

Distance | 3 | 5 | • | 0 | Enter

Display

E001_L001_L_D035.0

4.7 MODE 5: HOW TO EDIT A BRANCH TABLE

The branch table is the internal database listing the desired traffic directions at each branch in the guidepath to get from L-code to L-code.

PROCEDURE:

1 Enter password following the procedure in Section 4.2.

2 Enter branch table edit mode.

Mode #	5	Enter

3 Edit the branch table.

a. Enter "from" L-code.

L-Code #	*L-code, 1-255*	Enter

b. Enter "to" L-code.

2	L-Code #	*L-code, 1-511*	Enter

c. Enter the branch direction (0 = left, 1 = right).

Function	*branch, 0-1*	Enter

4 To continue building a table, repeat step 3 until finished.

- To go to the ***next*** L-code:

Enter

- To go to the ***previous*** L-code:

–	Enter

NOTES:

- This procedure must be done in order.
- The default branch direction is left.

EXAMPLE:

Task

Edit the branch table with the following statement: To get from L-code 2 to L-code 256, branch right.

Branch table

From L-code	To L-code	Direction
002	003	R

Key sequence to begin edit mode

Mode # | 5 | Enter

Key sequence to enter data

a. Enter "from" L-code.

L-Code # | 2 | Enter

b. Enter "to" L-code.

2 | L-Code # | 3 | Enter

c. Enter the branch direction (0 = left, 1 = right).

Function | 1 | Enter

Display

@L002_2L003_DirR

4.8 MODE 6: HOW TO EDIT AN ACTION TABLE

The action table is the internal database listing which function to perform at each event on the guidepath.

PROCEDURE:

1 Enter password following the procedure in Section 4.2.

2 Enter event action table edit mode.

Mode #	6	Enter

3 Edit the event action table.

a. Enter the event to edit.

Event #	*event, 1-999*	Enter

b. Enter the action code from Appendix A.

Function	*action, 01-37*	Enter

c. Set the action parameters, if applicable, from Appendix A.

1	Function	*parameter 1*	Enter

2	Function	*parameter 2*	Enter

4 Continue building the table by repeating step 3 until finished.

- To go to the ***next*** event:

Enter

- To go to the ***previous*** event:

–	Enter

NOTES:

- This procedure must be done in order.

EXAMPLE:

Task

Edit the action table with the following statement: Event 1 is a temp stop with tone lasting 0 minutes, 20 seconds.

Action table

Event	Action Code	Parameter 1	Parameter 2
001	01	0	20

Key sequence to begin edit mode

Mode # | 6 | Enter

Key sequence to enter data

a. Enter the event to edit.

Event # | 1 | Enter

b. Enter the action code from Appendix A.

Function | 0 | 1 | Enter

c. Set the action parameters, if applicable, from Appendix A.

1 | Function | 0 | Enter

2 | Function | 2 | 0 | Enter

Display

E001_A01_1A000_2A020

4.9 MODE 8: HOW TO DISPLAY DIAGNOSTIC INFORMATION

The display on the Route Manager provides access to diagnostic information.

PROCEDURE:

1 Enter information mode.

Mode #	8	Enter

2 Enter the number, listed in Appendix B, for the diagnostic information you want displayed.

Function	*1-12*	Enter

EXAMPLE:

Task

Display the battery voltage.

Key sequence to begin information display mode

Mode #	8	Enter

Key sequence to display information

Function	1	Enter

Display

Batt = 24.00

4.10 MODE 9: CONFIGURATION PROCEDURES

Configuration parameters are internal settings for changing vehicle behavior for different facilities.

PROCEDURE:

1 Enter password following the procedure in Section 4.2.

2 Enter configuration mode.

Mode #	9	Enter

3 Enter the configuration parameter to change.

Function	*1-12*	Enter

4 Enter applicable parameters from Appendix C.

- For cfg 3:

Function	*000000-999999*	Enter

- For cfg 7, 8, 10 and 11:

Function	*parameter 1*	Enter

- For cfg 4 or 5:

Function	*parameter 1*	•	*parameter 2*	Enter

NOTES:

- This procedure must be done in order.

EXAMPLE:

Task

Change the password to 654321.

Key sequence to begin configuration mode

Mode #	9	Enter

Key sequence to change the configuration parameters

a Enter the configuration parameter to change:

Function	3	Enter

b Enter applicable parameters for cfg 3 from Appendix B.

Mode #	6	5	4	3	2	1	Enter

Display

MODE9: 1=ToCrd, 2=FrmCrd, 3=Paswd, 4=LowBt, 5=Tstp, 6=HdAngle, 7=FcdOn, 8=Goslw, 9=CRC, 10=TrnSigs, 11=O/E TrnSigs

Appendix A ACTION CODES

CODE	FUNCTION	PARAMETERS
0	**No stop** Causes the vehicle to continue traveling the guidepath as it was before it reached the event.	1) N/A 2) N/A
1	**Temp (temporary) stop, with tones** Causes the vehicle to come to a stop, sound its stop tones and remain stopped for an amount of time determined by the parameters. The Mailmobile then automatically resumes travel.	1) Duration, 0-20 minutes 2) Duration, 0-59 seconds Note: If P1 & P2 are 0, temp stop default time will be used.
2	**Temp (temporary) stop, with no tones** Causes the vehicle to come to a stop and remain stopped for an amount of time determined by the parameters. The vehicle then automatically resumes travel.	1) Duration, 0-20 minutes 2) Duration, 0-59 seconds Note: If P1 & P2 are 0, temp stop default time will be used.
3	**Perm (permanent) stop, with tones** Causes the vehicle to come to a stop and sound its stop tones. To restart, vehicle must receive GO signal from green switch or external GO device.	1) 0 = heart beat OFF, 1 = heart beat ON. 2) N/A
4	**Perm (permanent) stop, with no tones** Causes the vehicle to come to a stop. To restart, vehicle must receive GO signal from green switch or external GO device.	1) 0 = heart beat OFF, 1 = heart beat ON. 2) N/A
5	**Radio transmitter (303 MHz) on, code 00** Causes the vehicle to send a coded radio signal for 5 seconds, if equipped with a transmitter. The radio signal actuates an annunciator, door opener or other device.	1) N/A 2) N/A
6	**Radio transmitter (303 MHz) on, code 01** Causes the vehicle to send a coded radio signal for 5 seconds, if equipped with a transmitter. The radio signal actuates an annunciator, door opener or other device.	1) N/A 2) N/A
7	**Radio transmitter (303 MHz) on, code 10** Causes the vehicle to send a coded radio signal for 5 seconds, if equipped with a transmitter. The radio signal actuates an annunciator, door opener or other device.	1) N/A 2) N/A
8	**Radio transmitter (303 MHz) on, code 11** Causes the vehicle to send a coded radio signal for 5 seconds, if equipped with a transmitter. The radio signal actuates an annunciator, door opener or other device.	1) N/A 2) N/A
9	**Radio transmitter (300 MHz) on** Causes the vehicle to send a coded radio signal for 5 seconds, if equipped with a transmitter. The radio signal actuates an annunciator, door opener or other device.	1) N/A 2) N/A

CODE	FUNCTION	PARAMETERS
10	**Toe switch inhibit & increase no-line to 12" for 10 feet** Causes the vehicle to disable its toe switches and allow 12" no-line gap for 10 feet. This is typically used when crossing the threshold of steep ramps. After 10' the toe switches are enabled and the no-line gap is returned to 6".	1) N/A 2) N/A
11	**Caution stop** Causes the vehicle to come to a stop for 4 seconds, then restart and travel at 50' per minute for entered distance, after which travel at 100' per minute is resumed.	1) Distance before vehicle resumes speed, 0 to 68 feet. If 0 is entered vehicle will travel 10'. 2) N/A
12	**Ignore codes for 10 feet** Causes the vehicle to ignore all function and location codes for 10 feet.	1) N/A 2) N/A
13	**Caution light on** Causes the vehicle to turn on the caution lamp, if so equipped, until a caution light off event.	1) N/A 2) N/A
14	**Caution light off** Causes the vehicle to turn off the caution lamp, if so equipped, until a caution light on event or the vehicle is reset.	1) N/A 2) N/A
15	**Tone volume high** Causes the vehicle to turn up the tone volume to high until a tone volume low event.	1) N/A 2) N/A
16	**Tone volume low** Causes the vehicle to turn down the tone volume to low until a tone volume high event or the vehicle is reset.	1) N/A 2) N/A
17	**Alarm on** Causes the vehicle to sound the alarm tone sequence until an alarm tone off event or the vehicle is reset.	1) N/A 2) N/A
18	**Alarm off** Causes the vehicle to stop sounding the alarm tone until an alarm tone on event.	1) N/A 2) N/A
19	**Alarm on for 10 feet** Causes the vehicle to sound the alarm tone sequence for 10 feet, then resume normal tones.	1) N/A 2) N/A
20	**Traffic control zone start** Causes the vehicle to listen for radio blocking signals from other vehicles that have entered a traffic control zone and then claim the zone for itself if no others have ownership or when others have exited.	1) N/A 2) N/A
21	**Traffic control zone end** Causes the vehicle to stop claiming ownership of a traffic control zone by turning off the radio blocking signal.	1) N/A 2) N/A
22	**Go slow** Causes the vehicle to move at 50' per minute until a resume speed code event or the vehicle is reset.	1) N/A 2) N/A
23	**Resume speed** Causes the vehicle to move at 100' per minute.	1) N/A 2) N/A

CODE	FUNCTION	PARAMETERS
24	**Disable non-contact sensor and go slow** Causes the vehicle to shut off the non-contact sensor and move at 50' per minute until an enable non-contact sensor & resume speed event or the vehicle is reset. The vehicle only detects objects that activate the touch-sensitive bumpers during this maneuver.	1) N/A 2) N/A
25	**Enable non-contact sensor and resume speed** Causes the vehicle to activate the non-contact sensor and move at 100' per minute. The vehicle detects objects before touching them.	1) N/A 2) N/A
26	**Disable non-contact sensor and go slow for 10 feet** Causes the vehicle to shut off the non-contact sensor and move at 50' per minute for 10 feet. The vehicle only detects objects that activate the touch-sensitive bumpers during this maneuver.	1) N/A 2) N/A
27	**Reverse direction by dead reckoning** Causes the vehicle to move backward and ignore the guidepath.	1) Head Angle, 0-180°. 90° is straight ahead, 0° is full port (left), 180° is full starboard (right). 2) Distance, 0-255 inches.
28	**Go forward by dead reckoning** Causes the vehicle to move forward and ignore the guidepath.	1) Head Angle, 0-180°. 90° is straight ahead, 0° is full port (left), 180° is full starboard (right). 2) Distance, 0-255 inches.
29	**Go forward & recapture guidepath by dead reckoning** Causes the vehicle to move forward when operating ***off*** the guidepath, then attempt to detect the guidepath again. ***Note:*** the head angle of the vehicle will be 90° (straight ahead) when using this action.	1) Ignore guidepath window, 0-255 inches 2) Recapture window, 0-255 inches.
30	**FIM Mode 0: interlock/retrigger** Causes the vehicle to stop and activate its Facility Interface Module (FIM), if so equipped. The FIM sends a signal once every second until it receives a reply. When the FIM receives a correct reply or interlock, the vehicle resumes travel.	1) Data to be sent. 2) Receive data needed to complete the interlock. ***Note:*** See the FIM documentation for setting the data bits.
31-33	**Reserved**	1) N/A 2) N/A

CODE	FUNCTION	PARAMETERS
34	**Chain route** Causes the vehicle to perform routes sequentially. For example, the vehicle could perform route 3, then route 4.	1) Next route, 1-20. 2) N/A
35	**Disable non-contact sensor and go slow for a distance** Causes the vehicle to shut off the non-contact sensor and move at 50' per minute for a programmed distance, then reactivate the sensor and resume travel at 100' per minute. The vehicle only detects objects that activate the touch-sensitive bumpers during this maneuver.	1) Distance before the vehicle resumes speed and sensors are on again, 0-68 feet. 2) N/A
36	**Blink right for a distance** Causes the vehicle to flash its right-side indicator lights for a certain distance.	1) Distance before the vehicle resumes normal light patterns, 0-68 feet. 2) N/A
37	**Blink left for a distance** Causes the vehicle to flash its left-side indicator lights for a certain distance.	1) Distance before the vehicle resumes normal light patterns, 0-68 feet. 2) N/A
38	**Branch at a distance** Causes the vehicle to branch at a specified distance from an L-code. The vehicle will branch for 3' starting at the distance in the location table.	1) 0 = left, 1 = right 2) N/A
39	**Reserved**	1) N/A 2) N/A
	Codes 40 through 50 may be used only as part of a dead reckoning sequence.	
40	**Perm stop tone DR** Causes the vehicle to come to a stop and sound its stop tones. To restart, vehicle must receive GO signal from green switch or external GO device.	1) N/A 2) N/A
41	**Perm stop no tone DR** Causes the vehicle to come to a stop. To restart, vehicle must receive GO signal from green switch or external GO device.	1) N/A 2) N/A
42	**Temp stop tone DR** Causes the vehicle to come to a stop, sound its stop tones and remain stopped for an amount of time determined by the Parameters. The vehicle then automatically resumes travel.	1) Duration, 0-20 minutes 2) Duration, 0-59 seconds Note: If P1 & P2 are 0, temp stop default time will be used.
43	**Temp stop no tone DR** Causes the vehicle to come to a stop and remain stopped for an amount of time determined by the parameters. The vehicle then automatically resumes travel.	1) Duration, 0-20 minutes 2) Duration, 0-59 seconds Note: If P1 & P2 are 0, temp stop default time will be used.
44	**Proxi off DR** Causes the vehicle to disable the proxi until an enable proxi event or the vehicle is reset. The vehicle only detects objects that activate the touch-sensitive bumpers during this maneuver.	1) N/A 2) N/A

CODE	FUNCTION	PARAMETERS
45	**Proxi on DR** Causes the vehicle to enable the proxi and continue travel.	1) N/A 2) N/A
46	**Radio transmitter (303MHz) on, code 00 DR** Causes the vehicle to send a coded radio signal for 5 seconds, if equipped with a transmitter. The radio signal actuates an annunciator, door opener or other device.	1) N/A 2) N/A
47	**Radio transmitter (303MHz) on, code 01 DR** Causes the vehicle to send a coded radio signal for 5 seconds, if equipped with a transmitter. The radio signal actuates an annunciator, door opener or other device.	1) N/A 2) N/A
48	**Radio transmitter (303MHz) on, code 10 DR** Causes the vehicle to send a coded radio signal for 5 seconds, if equipped with a transmitter. The radio signal actuates an annunciator, door opener or other device.	1) N/A 2) N/A
49	**Radio transmitter (303MHz) on, code 11 DR** Causes the vehicle to send a coded radio signal for 5 seconds, if equipped with a transmitter. The radio signal actuates an annunciator, door opener or other device.	1) N/A 2) N/A
50	**FIM interlock DR** Causes the vehicle to stop and activate its Facility Interface Module (FIM), if so equipped. The FIM sends a signal once every second until it receives a reply. When the FIM receives a correct reply or interlock, the vehicle resumes travel.	1) Data to be sent. 2) Receive data needed to complete the interlock. ***Note:*** See the FIM documentation for setting the data bits.

Appendix B MODE 8, DIAGNOSTIC INFORMATION

The functions in Mode 8 can provide information about the operation of the vehicle to assist troubleshooting and programming. The vehicle may be run in this mode to display, for example, distance past last L-code. Below, each function in this mode is listed along with a description of that function. This mode is not password protected.

FUNCTION #	DESCRIPTION	EXAMPLE
1	**Bat. (battery voltage)**	23.84
2	**Dist. (distance past last L-code)**	319.11
3	**Enc. (encoder counts)**	1DA7 H
4	**LstL. (last L-code)**	106
5	**LstF. (last F-code)**	14
6	**Spd. (current speed)**	100
7	**#Gd. (number of good codes)**	003B H
8	**#Bd. (number of bad codes)**	002C H
9	**SwRv. (software revision)**	0A, 4
10	**Attn. (attenuator)**	0x08
11	**Null. (steering null)**	NullAmpl. Now
12	**UV. (UV lamp output)**	UV=0x14

1. Battery Voltage
This function displays a time-averaged reading of the battery voltage. The MVP board uses this voltage reading to drive the battery meter LEDs.

2. Distance past last L-code
In normal operation, this displays distance, in feet and inches, that the vehicle has traveled since the last L-code. This can be used for determining the distance from an L-code to a specific location on the guidepath for building the action/location table. When dead reckoning, this displays the amount of distance to be traveled before the next event.

3. Encoder counts
This number shows encoder counts (in Hex) since startup. At power ON the encoder number resets to zero and counts up as the drive wheel turns forward and down as it turns in reverse. The encoder signal is used by the head to read codes and by the MVP board to calculate distance and speed. The actual number displayed is not important; what is important is that the numbers count up or down smoothly as the vehicle moves.

4. Last L-code number
Displays the number of the last L-code read. This can be used along with the distance past last L-code read when programming a new event.

5. Last F-code number

Displays the number of the last F-code read. This number is stored in memory so the last code read will be displayed even after a power down. Please see the table below for the F-code number and its corresponding function.

F-CODE	FUNCTION	F-CODE	4.10.1.1.1 FUNCTION
0	Temp stop, 20 sec., tone	22	Alarm pattern on for 10’
1	Temp stop, 20 sec., no tone	23	Not used
2	Temp stop, 60 sec., tone	24	Route A right, route B left
3	Temp stop, 60 sec., no tone	25	Route A left, route B right
4	Temp stop, 120 sec., tone	26	All routes right
5	Temp stop, 120 sec., no tone	27	All routes left
6	Perm stop, tone	28	Traffic control area start
7	Perm stop, no tone	29	Traffic control area end
8	Radio xmit 303MHz, code 00, bottom	30	Traction slow
9	Radio xmit 303MHz, code 01, 3rd	31	Traction fast
10	Radio xmit 303MHz, code 10, 2nd	32	Proxi off & traction slow
11	Radio xmit 303MHz, code 11, top	33	Proxi on & traction fast
12	Radio xmit 300MHz	34	Proxi off & traction slow for 10’
13	Toe switch inhibit & 12” no-line, for 10’	35	Temp stop 40 sec. tone
14	Safety stop 4 sec., slow for 10’	36	Temp stop 40 sec. no tone
15	Ignore all codes for 10’	37	Temp stop 240 sec. tone
16	Caution light on	38	Temp stop 240 sec. no tone
17	Caution light off	39	Perm stop with heart beat
18	Tone volume loud	40	Safety stop 4 sec., slow for 15’
19	Tone volume quiet	41	Safety stop 4 sec., slow for 20’
20	Alarm pattern on	42	Safety stop 4 sec., slow for 25’
21	Alarm pattern off		

6. Current speed in feet/minute
This reading is the vehicle’s current speed in feet per minute. The MVP board bases this reading from the encoder attached to the front wheel.

7. # of good codes read
This displays the number of good, or valid, codes the vehicle has read since power up, the value displayed is in Hex. This, along with number of bad codes, can be used to check the quality of codes on the guidepath.

8. # of bad (invalid) codes read
This displays the number of bad, or invalid, codes the vehicle has read since power up, the value displayed is in Hex. This, along with number of good codes, can be used to check the quality of codes on the guidepath.

9. Software revision and level
The revision and level of software are displayed. This software is located in the EPROM in location U19 on the MVP.

10. Attenuator
This number (in Hex) indicates brightness as seen by the sensor head. This value can be from the guidepath or background. The attenuator range is from 01 to 34. Attenuator shows how much the signal from the detectors must be reduced to reach a valid reading and is equivalent to the AGC reading in older vehicles. Lower numbers indicate brighter lines. Strong line = 01 to 05; no guidepath = 34; loss or gain of guidepath mid 20's. The attenuator value is used to drive the line intensity LED's on the tower interface board.

The attenuator can be used to identify code reading problems caused by guidepath that is too bright. A too bright guidepath can happen when a code is put down on a floor that has high background brightness. The resulting light output from the new code added to the background can produce a signal beyond the range of the attenuator. If the attenuator can no longer reduce the detector signal amplitude, the head "sees" the code spurs as being wider than their actual size. Think of looking directly into a bright light, it is difficult is see the edge of the light clearly as it is just one large blob of light. When the intensity of the light is reduced, the size and shape of the light can be seen more clearly.

To verify that a code reading problem is from a guidepath that is too bright, check the attenuator reading. If the reading is 01 the attenuator may be out of range. To correct this, reduce the width of the spurs using black tape and re-test the code. If reducing the spur width corrects the problem, redo the code using a lighter coat of guidepath fluid or make the spurs narrower. If the attenuator reading is 02 or greater, the code reading problem is not due to a code that is too bright.

11. Steering null (Böwe Bell & Howell service only)
This reading is used by service to zero out the steering servo amplifier, if required, after replacement. The steering servo amplifier should be adjusted to give a zero output with a zero input. To zero out the steering servo amplifier:

- Open the right side door of the vehicle to expose the steering servo amplifier.
- Use the Route Manager to select mode 8, function 11. The display will show the message **Null Ampl. Now**.
- Connect a digital voltmeter (DVM) to Pins 1 and 2 of the green terminal block on the steering servo amplifier. The LED on the steering servo should be green.
- Adjust the test/offset pot (number 4) for a reading of 0V ± .05V on the DVM.
- Disconnect the DVM, and replace the right side door.
- Use the Route Manager to select mode 1 and test the vehicle for proper operation.

This method for the MM4A vehicle may also be used:

- Turn off the vehicle.
- Open the right side door of the vehicle to expose the steering servo amplifier.
- Disconnect the 16 pin input connector on the steering servo amplifier.
- Turn on the vehicle.
- Connect a DVM to pins 1 and 2 of the green terminal block on the steering servo amplifier. The LED on the steering servo should be green.
- Adjust the test/offset pot (number 4) for a reading of 0V ± .05V on the DVM.
- Disconnect the DVM and turn off the vehicle.
- Reconnect the 16 pin input connector to the Steering Servo Amp.
- Replace the right side door and test the vehicle for proper operation.

12. UV light output

In the current version of Sensor Head software this reading is no longer supplied.

Appendix C MODE 9, CONFIGURATION SETTINGS

The functions in Mode 9 allow the vehicle to be configured to meet the site requirements along with some additional service and programming functions. Each function is listed along with a description of that function. This mode is password protected.

FUNCTION #	DESCRIPTION	ENTER
1	**Write to a memory card**	N/A
2	**Read from a memory card**	N/A
3	**Password**	New password
4	**Low battery level**	Voltage
5	**Temp stop default time**	Minutes, seconds
6	**Head angle**	Steering angle
7	**F-code reading**	0 = ignore F-codes, 1 = read F-codes
8	**Go slow**	0 = Normal speed 1 = Slow speed
9	**Cyclical redundancy check**	N/A
10	**Turn signals**	0 = Signals off 1 = Signals on
11	**Odd/even turn signals**	0 = All L-codes 1-255 1 = Odd L-codes 1-255

1. Write to PCMCIA memory card (Böwe Bell & Howell service only)
Note: Turn off the vehicle before inserting or removing the card.
This function saves the vehicle program to the PCMCIA card after changes have been made. The CRC must be reset before program can be saved to the card (see page C-4). To write the vehicle program to the card:

1. Move the write protect switch to the write enabled position.
2. Enter function 1. The message: **XFER BAD, Hit<Enter>** is displayed if you attempt to write to a card that has been write-protected. If the transfer is successful, the message **Hit<Enter> Cpy TO Card done** is displayed.
3. After writing to the card, move the write protect switch to the write protect position to prevent the program from being erased.

2. Read from PCMCIA memory card
Note: Turn off the vehicle before inserting or removing the card.
This function copies the data tables from the PCMCIA card to the MVP board. Any existing tables on the MVP board are erased. When using this function, make sure the card has the write protect switch in the write protect position to prevent the data from accidentally being overwritten. The message **Hit<Enter> Cpy FROM Card done** is displayed if the transfer is successful. If the transfer is not successful, the display returns to Mode 9 with no error message.
Use this function in one of these three situations:

- After an MVP board has been replaced and the program is copied to the new board.
- When a program is being copied from one vehicle to another.

- If the original program is being restored after a programming error.

Note: The vehicle's memory can be cleared by copying a blank card to memory using this function. However, the card being used for this memory clearing must have been first written to using Mode 9 Function 1; this is to be done from a vehicle with a blank memory. If you attempt to copy from a card that has not been written to, the following error will be displayed on the Route Manager: **BAD CRC, NoXfer, Hit <Enter>**.

3. Set password

This allows you to change the password to any six digit number. This password is stored on the MVP board and controls access to Modes 2, 3, 4, 5, 6, 7 and 9. The default password is 111111, typically this number is not to be changed. If for some reason this number must be changed be sure to record the new number.

Note:

- If the password number has been changed and the new number has been lost, the MVP board must be replaced to reset the password back to the default and allow access to the unit.
- The password is copied to the PCMCIA card during a program copy and then written to the vehicle when the program is down loaded.

4. Low battery level (Böwe Bell & Howell service only)

The MVP board uses this setting to determine the low battery point. Range is between 20.0 and 24.0 volts. When this voltage is reached, the vehicle will continue to operate in auto until a perm stop is reached. The default setting is 23.24 volts.

Note:

- The display may not show the exact voltage entered. The MVP board uses an internal list of voltages and the processor selects the one closest to the entered value.

5. Set temp stop default time

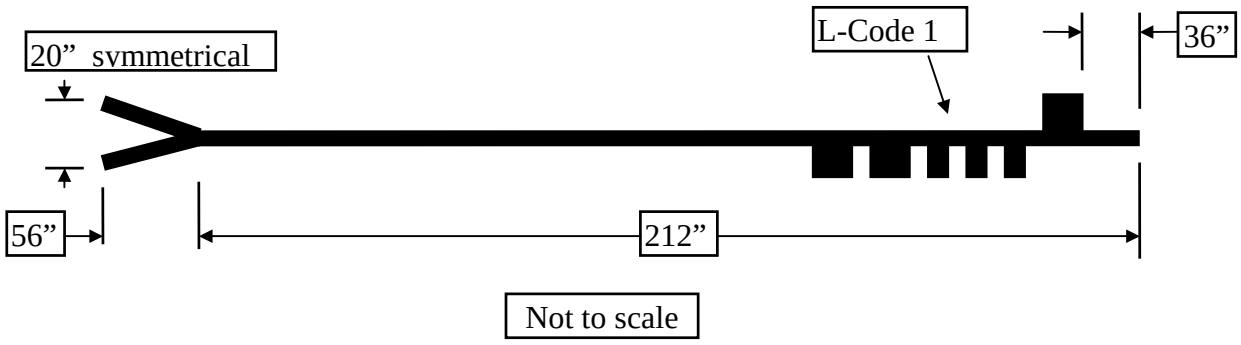
This is the amount of time the vehicle will use for a temp stop if a time is not entered in the action table for action codes 1 and 2. The Temp stop time is entered in minutes and seconds.

6. Set head angle (Böwe Bell & Howell service only)

This function is used to fine tune the head angle during Dead Reckoning. Set after the MVP board or any steering components have been replaced or adjusted, or if, in dead reckoning, the vehicle does not travel in a straight line, with a head angle of 90°. To set the head angle follow the below steps:

Caution: As a precaution, copy the program to a PCMCIA memory card (mode 9, function 1) before entering the test program. To delete the test program, delete each entry or copy the original program from the PCMCIA card to memory using mode 9, function 2.

1. Set up the test track (shown below) on a flat floor of concrete or tile. This should not be done on carpet as the nap of the carpet can affect the vehicle path. The V is set to ±10º for recapturing. The distances are set to test dead reckoning within ±4%.



2. Enter the following program into the vehicle. *If the vehicle contains a program in this number sequence, pick other event and route numbers.

Action / Location Tables

Event	Action Code	Parameter 1	Parameter 2	From L-Code	Direction	Distance
*901	27	90	255	1	L	1.6
*902	29	0	60	1	L	1.6

Route Table

Route	Step	Event
*20	1	901
*20	2	902
*20	3	0

3. Start the vehicle from the end of the track opposite the L-code.
4. After the L-code the vehicle should slow down, stop and immediately start traveling straight backward until it is beyond the Y, and stop. Then immediately start traveling straight forward, recapture the line, speed up, and repeat.
5. Let the vehicle make several runs to verify tracking.
6. If the vehicle swings too far to the starboard, change the head angle setting to a higher number. If the vehicle swings too far to the port, change the head angle setting to a lower number.
7. Repeat until the optimum setting has been found. Allow the vehicle to make several runs after each change.

7. F-code reading

The vehicle can be set to ignore or read function codes. This may be used if function codes are on the guidepath but are no longer being used.

8. Speed

Change this setting to 1 to force the vehicle to run only on slow speed. If set to run at normal speed the vehicle can be slowed as needed by using a go slow code. Note, the vehicle will not run at the slow speed if "lost".

9. CRC reset
The CRC must be reset before saving the program to the PCMCIA card. Do this by exiting the programming mode or selecting this function.
Note: Rev H and later software will automatically reset the CRC each time the programming mode is exited.
Select this after you make changes to the vehicle memory. When successfully completed, the message **Hit <Enter>, new CRC stored** is displayed.

CRC or cyclical redundancy check is a checksum of the RAM containing the vehicle program. When CRC reset is selected, a checksum is calculated and stored in battery backed RAM. Then, as part of the power-up self-test the MVP board calculates the checksum of the RAM and compares this with the stored checksum, or CRC. If the numbers are different, the message **NV RAM Failure** is displayed. If this message is displayed at power-up, perform a CRC reset to clear the NV RAM failure message. If this does not clear, the NV RAM failure, the MVP board is most likely defective.

10. Turn signals
When ON (1), the vehicle uses turn signals after L-codes. The turn signals indicate which direction the vehicle will branch. This can be used for troubleshooting, as the vehicle will provide a visual indication that an L-code has been read.

Note:
- When this functions is ON, the vehicle will blink the turn signals after each L-code based on the event and branch tables.
- This function should be turned OFF when using action codes 36 and 37 to indicate turning directions.

11. Odd/even turn signals
When OFF (0), the turn signals function on all L-codes from 1 to 255. When ON, (1) the turn signals operate only on odd L-codes from 1 to 255. To make use of this function, use only odd L-codes before branches and even L-codes at all other locations.

Appendix D PCMCIA CARD

PCMCIA stands for **P**ersonal **C**omputer **M**emory **C**ard **I**nternational **A**ssociation. The PCMCIA card used on advanced vehicles is used to back-up the program and then can be used to restore the program in the event of an MVP board change or due to the loss of the program. This card contains Static Random Access Memory (SRAM). Download the program to the card at each service call or PM to ensure the program contained in the card is no older than 90 days. If necessary, the customer can download the program from the card into vehicle memory. However, he is not allowed to write a new program to the card. If any changes have been made to the program since the last back-up, they must be entered manually.

Card Storage
Move the write protect switch to the right to place it in protect mode (see below). The card is to remain plugged into the PCMCIA connector (P3) on the MVP board. Verify that the MVP compartment door has a foam rubber pad to hold the card in place.

Card Maintenance (Böwe Bell & Howell service only)
The memory in the card is maintained by an internal battery, which should last several years before requiring replacement. The battery is a coin type lithium with a nominal voltage of 3.0 volts; the vendor number of the battery is BR2325. Check the battery voltage at each PM and replace if the voltage is under 2.70 volts. To check the battery voltage:

1. Locate the battery compartment lock on the PCMCIA card and slide the lock to the left using a voltmeter probe tip. See the card drawing below.

2. Remove the battery cover and slide out the battery.

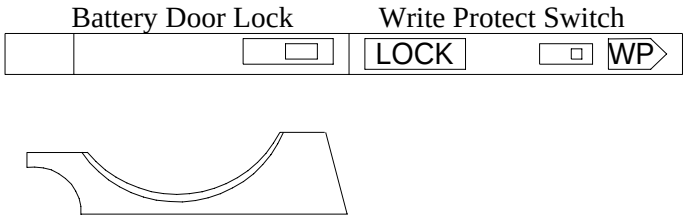
3. Place the battery + side down and measure the voltage. If below 2.70 Volts, replace the battery.

   Note: The battery voltage will increase slightly after it has been removed from the card. For this reason it is important to measure the battery voltage as soon as possible after it is removed from the card to get a true reading.

4. Slide the battery into the PCMCIA card, + side of the battery up, and replace the battery door. Be sure to lock the door once it is closed.

5. Place the PCMCIA card back into connector P3 on the vehicle MVP board.

PCMCIA card end view



Battery door shown removed

Appendix E TABLES

This section contains blank forms to be used for the route table, location table, branch table and action table.

Böwe Bell & Howell strongly recommends to keep copies of the current tables available to the key operator and service manager at all times.

The table on page E-6 combines the action and location table onto one page. This may be used in place of separate tables.

ROUTE TABLE
Mode 2

Customer/Site: _____

Vehicle S/N: _____

Date: _____

By: _____

Route	Step	Event

LOCATION TABLE
Mode 4

Customer/Site: _____
Vehicle S/N: _____
Date: _____
By: _____

Event	From L-code	Direction	Distance

BRANCH TABLE
Mode 5

Customer/Site: ____________________
Vehicle S/N: ____________________
Date: ____________________
By: ____________________

From L-code	To L-code	Direction	Possible

ACTION TABLE
Mode 6

Customer/Site: _____
Vehicle S/N: _____
Date: _____
By: _____

Event	Action Code	Parameter 1	Parameter 2

ACTION/LOCATION TABLES

Customer/Site: _____

Vehicle S/N: _____

Date: _____

By: _____

	Action Table (Mode 6)			Location Table (Mode 4)			
Event	**Action**	**Parameter 1**	**Parameter 2**	**From L-code**	**Direction**	**Distance**	**Comments**

GLOSSARY

Action
The specific function that the vehicle performs at an event, such as a temporary stop.

Action Code
Numeric code in the vehicl e's memory that defines the function which it is to perform. Action codes are used in the action table.

Action Parameters
Variables that provide additional data for an action code, such as 1 minute, 30 seconds for a temporary stop. Action parameters are used in the action table.

Action Table
Internal database listing what function to perform at each event on the guidepath.

Branch
Y-shaped intersection where the vehicle can turn right or left.

Branch Table
Internal database listing turns at each branch in the guidepath to get from L-code to L-code.

Configuration Parameters
Internal settings that can be changed to cause the vehicle to behave in slightly different ways for different facilities.

Dead Reckon
Automatic travel off of the guidepath.

Direction
The right or left side of the branch that the vehicle must follow to reach an event. Direction is used in the branch table and location table.

Distance
The length of guidepath the vehicle must travel after a L-Code to reach a specified event. Distance is used in the location table.

Event
An event is an action at a location. Events are used in the location, action and route tables.

F-Code (Function Code)
A 4-5 spur fluorescent barcode oriented perpendicular to the guidepath that prompts the vehicle to perform a function, such as a temporary stop. F-codes are not used by the route manager.

Guidepath
The fluorescent track that vehicles follow when in automatic mode.

L-Code (Location Code)
A 6-11 spur fluorescent barcode oriented perpendicular to the guidepath that prompts the vehicle to begin counting the distance to the next Event. L-codes are used in the location table and branch table.

Location
The specific direction and distance from an L-code where the vehicle performs an action.

Location Table
Internal database that lists where events are in relation to the L-Codes.

Mailmobile or Packmobile System
The Mailmobile or Packmobile vehicle, guidepath and accessories.

Map
The information programmed into the vehicle that represents the actual guidepath in your facility. A map is made up of a branch table, location table and action table.

Merge
A Y-shaped intersection where two branches come together.

Port
The left side when facing the direction of vehicle travel.

Route
A series of events the vehicle performs in a specific sequence.

Route Table
Internal database listing the events to perform along all routes.

Starboard
The right side when facing the direction of vehicle travel.

Step
A single event in a route. Steps define the sequence in which the vehicle performs a route.

NOTES:

NOTES: