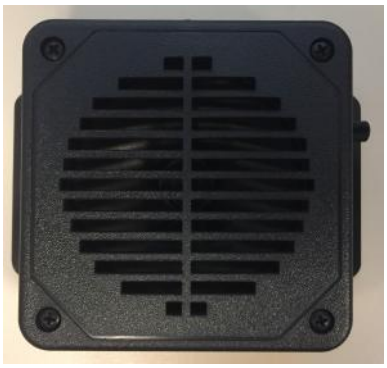
Instructions

INTERMOTIVE VEHICLE CONTROLS
An ISO 9001:2015 Registered Company



FlexSpeak™ ADA "Talking Bus"

Installation and Operating Instructions

System Overview

VAM403 is a voice annunciator module designed to ensure transit authorities can meet ADA compliance requirements for announcing and displaying transit stops. GPS location is used to automatically update internal transit signs and announce arrival and departure messages for stops along pre-defined routes. Audio and sign messages for each stop are fully customizable and stored on an external SD card. The system supports defining up to 70 unique routes, each with a maximum of 72 stops.

Additionally, the module can announce specific audio messages upon triggers from four (4) hardware inputs and 56 virtual inputs, for a total of 60 unique messages. The virtual inputs are controlled using the LIN communication protocol and functions as a LIN slave which is triggered by a LIN master device, separate from the VAM module.

All audio messages can be configured using the FlexSpeak Programming Utility software, with options for message priority, repeat frequency, and output mode. The system is equipped with an interface that allows audio playback through the vehicle's speakers via a PA system if one is installed. VAM403 also includes an interface for displaying text on an interior sign. Messages can be played through the integrated speaker included in the module, an external PA system, or both outputs simultaneously.

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Installation Instructions

IMPORTANT — READ BEFORE INSTALLATION

It is the installer's responsibility to route and secure all wiring harnesses where they cannot be damaged by sharp objects, mechanical moving parts and high heat sources. Failure to do so could result in damage to the system or vehicle and create possible safety concerns for the operator and passengers.

Avoid placing the module where it could encounter strong magnetic fields from high current cabling connected to motors, solenoids, etc. Avoid radio frequency energy from antennas or inverters next to the module. Avoid high voltage spikes in vehicle wiring by always using diode clamped relays and solenoids when installing upfitter circuits.

CAUTION

All electronic products are susceptible to damage from Electrostatic Discharge or ESD. Ground yourself before handling or working with the module and harnessing by first touching chassis ground.

Module Mounting

Locate a suitable location to mount the Talking Bus module near the driver position. Drill a 1 3/4" hole at the mounting location to allow for harnessing routing. Do not mount the module until testing is completed and all wire harnesses are routed and secure. The last step will be to mount the module.

Module Harnessing

2-Pin Power Pinout

- **Hot-In-Run**, Pin #1, Red—Connect this pin to the vehicle's Hot-In-Run power connection.
- **Ground**, Pin#2, Black—Connect this pin to vehicle ground.
- **Mating connector**—Molex Mini-Fit Jr. 39012020

4-Pin GPS Connector

- The GPS connector is used to connect directly to the GPS module supplied by InterMotive.

4-Pin LIN Connector

- The LIN connector can be used to connect the Talking Bus module to a LIN master, if configured.
- See schematic for connector pinout definition.
- **Mating connector**—TE Connectivity AMPMODU MTE 104257-3

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8-Pin Input Connector Pinout

- See Table 1 and schematic for connection details.
- **Mating connector**—Molex Mini-Fit Jr. 39012080

Table 1—Input Connector Pinout and Functional Description

Input Number	Connector Pin Number	Wire Color	Active Voltage Level	System Function
1	1	PINK / BLACK	Active High (+12V Trigger)	Event / Level: Play Message 1
2	2	WHITE / BLACK	Active High (+12V Trigger)	Event / Level: Play Message 2
3	3	GREEN / BLUE	Active High (+12V Trigger)	Event / Level: Play Message 3
4	4	BLUE / WHITE	Active High (+12V Trigger)	Event / Level: Play Message 4
5	5	BROWN / BLACK	Active High (+12V Trigger)	RESERVED
6	6	WHITE / ORANGE	Active High (+12V Trigger)	RESERVED
7	7	ORANGE / BLACK	Active Low (Ground Trigger)	Event: Route decrement (only in route select) Level: Enable PA Volume Adjust
8	8	YELLOW / BLACK	Active Low (Ground Trigger)	Event: Route Increment (only in route select) Level: Enter Route Select

3-Pin Interior Sign Connector

- The interior sign connector connects directly to the Transign interior LED sign.
- See schematic for connector pinout definition.

PA System Connections

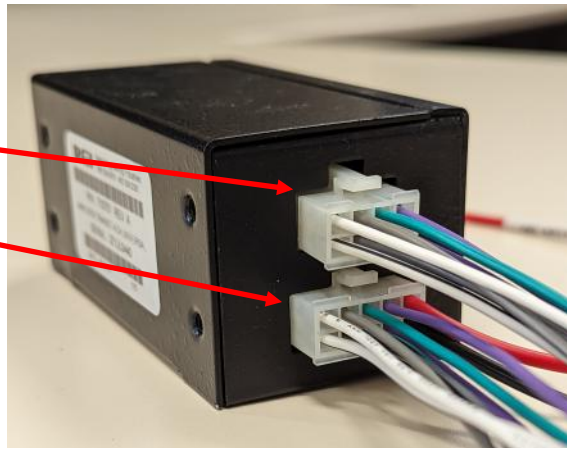
- The PA System is to be installed between the vehicle's radio and the vehicle's speakers. Connect the radio's audio output connections to the PA connections labeled "Radio Input." There are 8 total connections for four speakers with a + and - connection (Left Front, Right Front, Left Rear, Right Rear).
- Connect the vehicle's speaker wires to the PA connections labeled "Speaker output." There are 8 total connections for four speakers with a + and - connection (Left Front, Right Front, Left Rear, Right Rear).
- Connect the PA power wires to Hot-In-Run (Red wire) and Ground (Black wire)
- The 4-pin Philmore connector connects the Talking Bus to interface to the PA system to allow for audio playback through the vehicle's speakers. The module contains a configuration which allows the user to select specific messages to be played through the PA system only, the module's self-contained speaker only, or both.
- See next page for PA options and differences.

Instructions

REI 4-Channel PA:

Radio Harness

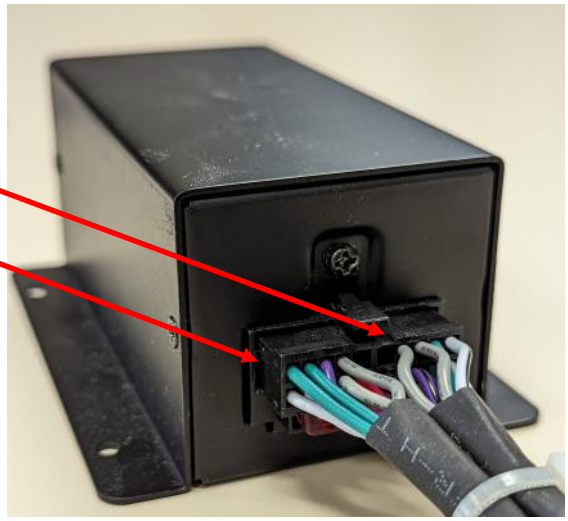
Speaker Harness

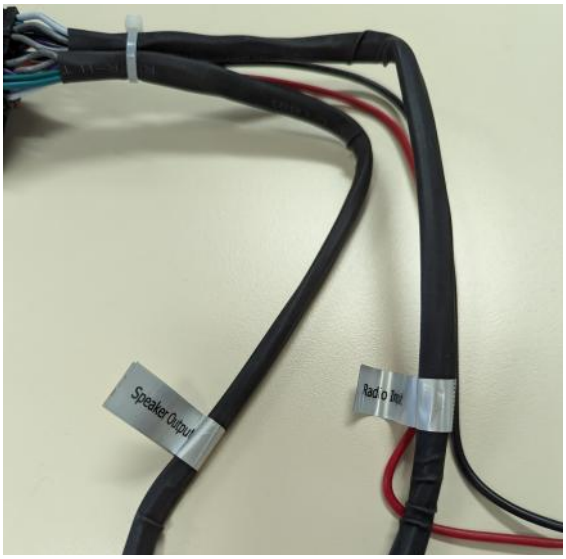


Jensen JPA600:

Radio Harness

Speaker Harness





Hardware Description

Power Systems

The VAM403 module is designed to draw current only when the vehicle is running and is powered by the Vehicles Hot-In-Run +12V power distribution system via the 2-pin power connector. The module draws less than 200mA under normal operating conditions.

Serial Communication Interface

A serial communication interface is provided on the module to allow for viewing the module configuration information, firmware version, initialization messages, and error messages. Additionally, the serial interface provides a means for updating the modules firmware through the Flexspeak Programming Utility. The serial communication interface is shared with the GPS module and the GPS module must be disconnected prior to using the serial interface.

Serial Communication Configuration

A serial terminal program like TeraTerm and an InterMotive download cable are required for establishing serial communications between the module and PC. The serial port Configuration is provided in Table 2.

Table 2—Serial Terminal Configuration Parameters

Serial Interface Parameter	Value
BAUD Rate	9600
Data Bits	8
Stop Bits	1
Parity	None
Hardware Flow Control	None

MicroSD Card

The microSD card slot is located on the side of the module between the volume control knob and serial interface port. All files required for normal system operation are stored on the SD card and include audio files, configuration files, and route files. The microSD card must be an SDHC type formatted with a FAT32 file system. **To remove the SD card**: gently push it in and release, using a small object if necessary, and it should eject.

NOTE: SDXC cards and the exFAT file system are not supported by the VAM module.

On startup, the system will check for an SD card and determine if the SD card is the proper type and format. A missing SD card or Incorrect SD card format will trigger a diagnostic message to play and the system will fail to initialize. A detailed description of the SD card and associated file system can be found in their respective sections of this manual.

NOTE: The microSD card must be inserted with the contacts facing down. If the card is inserted upside down then it may become stuck in the connector or break the connector.

Insert with contacts facing down

Discrete Inputs (Hardware Inputs)

VAM modules are equipped with eight (8) voltage level hardware inputs for use in triggering discrete audio messages, selecting routes, and adjusting the PA system volume. Inputs are activated when their voltage level reaches the threshold for activation which is +12V for active-high inputs, and ground for active-low inputs. Two types of input signals can be used to trigger inputs, event-based triggers (pulses) and level-based triggers.

Event Trigger (Pulse Trigger)

The event trigger is actuated for inputs when a voltage pulse is sensed on the associated input. The pulse duration for event triggering must be between 80ms and 600ms. Pulse durations exceeding 600ms will be interpreted as a level trigger. If a message latch is set due to an event trigger, the event trigger can always be overridden with a level trigger.

Upon receiving an event trigger, the associated message latch will be toggled, and the message will play if in the active state. For messages which are configured to repeat, the message latch will alternately activate and deactivate on receipt of an event trigger. While a message latch is set, repeating messages will continue to play at the specified interval.

Level Trigger

The level trigger is actuated for an input when the voltage sensed on the input reaches the threshold voltage for greater than 600ms. While the voltage level remains at the active level, the message latch will be set. Additionally, level triggers always take precedence over event triggers and will override any existing event trigger on a given input.

For repeating messages, the message will continue to repeat at the specified interval until the level trigger is cleared.

VAM403 Discrete Input Mapping

Inputs one (1) through four (4) are used in triggering audio messages. Inputs five (5) and six (6) and reserved for future use, and inputs seven (7) and eight (8) are used for route selection and PA volume Adjustment. The inputs are accessible via the 8-Pin connector on the module and a detailed description of each input is provided in Table 1.

LIN Messaging (Virtual Inputs)

The LIN connector can be used to connect the VAM module to a LIN master, such as the PRPC in the InterMotive FlexTech system. This connection provides the module with LIN commands to trigger 56 virtual inputs on the VAM module. All virtual input triggers are treated as level triggers for the purpose of message playback.

PA System

VAM modules can play audio messages over the vehicle's speakers through a connection to a PA system. The PA system works by passing the vehicle's radio output to the vehicle's speakers until a message is ready to be announced. When the PA system is activated, the system will interrupt the radio's audio output and switch to the PA system's audio input (coming from the Talking Bus or an external microphone), thus allowing the Talking Bus to play audio over the vehicle's speakers. The Talking Bus automatically switches the PA system if an input that is configured to be played over the PA system is activated.

PA Hardware Options

- REI 4-Channel PA
- Jensen JPA600(discontinued)

Internal Speaker

A small speaker, internal to the VAM module enclosure, is provided for audio message playback without the use of an external PA system. Audio can be configured to only play through the internal speaker if needed. Diagnostic messages and route selection messages are played on the internal speaker only.

Volume Control

Volume control is accomplished using the volume control knob located on the side of the module. Counter-clockwise rotation decreases volume and clockwise rotation increases volume. To adjust internal speaker volume, simply rotate the knob until the desired volume is reached.

To adjust PA volume, input seven (7) must be held in the "level trigger active" state before adjusting the volume control knob. Once input seven (7) has an active level trigger, PA volume adjustment is permitted and the knob may be rotated until the desired PA volume is reached. Release input seven (7) to return to normal volume control. The last known PA volume is recorded by the system and written to persistent storage so that the correct PA volume level can be restored on system startup.

GPS Receiver

The GPS receiver is a standalone module provided by InterMotive and connects to the VAM module via the 4-pin GPS connector. The GPS receiver may take up to 2-3 minutes to acquire signal in some situations and provides updated vehicle position data once per second.

Interior Sign

The interior sign is a standalone module distributed by Transign, LLC. and interfaces with the VAM module via the 3-pin sign connector. Additionally, the sign requires +12V Hot-In-Run power connection which is separate from the VAM module. The VAM module supports two (2) message formats for displaying sign text-based on the length of the message.

Short messages: less than eight (8) characters in length, are displayed as static text on the sign.

Long messages: between 8-39 characters in length, will be displayed as a scrolling message.

The maximum length of any sign message for the VAM system is 39 characters.

Audio System

Functional Description

The audio playback engine of the VAM module allows for queueing playback of up to eight (8) messages at a time (4 input messages + 4 route messages) in a priority FIFO queue (First In First Out). Any attempt to enqueue an audio file when the queue is full will fail, and the request will be discarded.

Audio in the playlist queue will be played back starting with the highest priority messages and in the order which they are sent to the queue. If two (2) messages enter the queue with the same priority level, messages are played based on the order in which they are added to the queue.

When a message is added to the playlist, the priority is checked against any audio that is currently playing. If the newly added message is a higher priority, playback is immediately cancelled, and the higher priority message begins playing.

All route messages are played at the lowest priority level (Priority = 4). This allows for queueing higher priority messages to interrupt route audio and queueing messages of the same priority level to play after route audio if necessary.

Each message has a set of configuration parameters used to define the behavior of audio playback, and are set in the Flexspeak Configuration Manager. The audio configuration is maintained in the configuration file on the SD card. A description of each audio configuration parameter is provided in the Audio Configuration Description section of this manual.

Supported Audio File Formats

The VAM module supports the MP3 file format only. Audio files must be placed in the playlist directory on the SD card and follow the naming conventions specified in the file system description. The bitrate of MP3 files is limited to 196kbps with a maximum sample rate of 48000 Hz. Exceeding the specified MP3 file bitrate and/or sample rate can cause errors and artifacts to be heard during audio playback (skips, stuttering, pops, etc.)

Audio Configuration Description

System Level Audio Configuration Options

System level audio configuration options apply at the highest level to the entire audio system. When a configuration option is set, all messages for that configuration file will use the specified options.

Default PA Volume

Sets the default PA volume level which is used if PA volume level was not previously set. Volume levels are expressed as percentage of full volume in 5% increments.

The default PA volume is located in the upper right corner of the FlexSpeak Configuration Manager.

System Level Audio Configuration Options - Continued

PA Radio Type Selection

Configures the system to use the specified PA radio. Select the option which matches the PA radio supplied with the module.

PA radio type selection is located on the Miscellaneous tab in the FlexSpeak Configuration Manager.

Chime Tone Selection

Specifies the chime tone to use when playing route arrival messages. The chime tone always precedes the arrival message. Three (3) default options are provided. Any audio file may be used to create a custom chime tone.

To specify a custom chime tone, select the option in the FlexSpeak Configuration Manager for “Custom” chime selection on the miscellaneous tab. Ensure that you have saved the chime audio file to the playlist directory as “chime.mp3”.

Arrival / Departure Messages Disabled

The system can be configured to disable playback of arrival or departure messages when running routes. When the option is selected to disable arrival or departure messages, the setting applies to all routes for that configuration file.

Disabling Messages is accomplished by selecting “File->Disable Messages” in the FlexSpeak Configuration Manager. Then select “Arrival” or “Next”. Once the selection is made, the associated message options should be disabled for editing.

Enabling messages is accomplished by selecting “File->Enable Messages” in the FlexSpeak Configuration Manager. Then select “Arrival” or “Next”. Once the selection is made, the associated message options should be enabled for editing.

Route Level Audio Configuration Options

None.

Message Level Audio Configuration Options

Priority Level

Sets the audio message priority level for playback. 1 = highest priority, 4 = lowest priority. Setting the priority for route messages is not allowed. All route audio and chime tones play at priority 4. The priority can be set in the FlexSpeak Configuration Manager under the Discrete and Virtual input tabs.

Message Level Audio Configuration Options - Continued

Repeat Mode (Frequency)

The VAM module has the ability to repeat triggered messages on a timed loop using the repeat mode (frequency) configuration option. Repeat mode is disabled for all route messages. The repeat mode can be set in the FlexSpeak Configuration Manager under the Discrete and Virtual input tabs for each message. The repeat timer starts when message playback is completed. When the repeat timer is expired, the message is again added to the playback queue. There are four (4) options for repeat mode.

- *Once*: Message plays only once per trigger even if the trigger remains active when playback is completed.
- *10 Seconds*: Message will repeat on a 10 second timer while the input is triggered.
- *30 Seconds*: Message will repeat on a 30 second timer while the input is triggered.
- *Looping*: Message will repeat on a one (1) second timer while the input is triggered.

Audio Output Mode

The audio system can be configured to output audio to the internal speaker and/or the PA system. The audio output mode can be set in the FlexSpeak Configuration Manager under the Discrete and Virtual input tabs. The output mode for route messages is set under the Stops tabs.

All diagnostic messages and route selection audio are configured to play over the module speaker only.

There are three (3) options for output configuration:

- *PA System Only*: Plays audio messages over the PA system only.
- *Module Speaker Only*: Plays audio messages over the module speaker only.
- *Both*: Plays audio messages over both the PA system and module speaker.

Track ID

The Track ID is the unique file name for the audio file associated with the input message, arrival message, or departure message. The track ID must adhere to the file naming conventions detailed in the File System section of this manual.

Track IDs for arrival and departure audio files can be selected using the “Load File” button in the FlexSpeak Configuration Manager under the stop configuration tabs for stops 1-72.

Track IDs for input messages are not assignable and the option to select the Track ID for input messages is disabled. Each input message audio file must be named using a standard naming convention of “TRK00xx” where xx is the numerical identifier of the message number. For tracks numbered one (1) through nine (9), always use a leading zero (0) before the numeric message number. For example:

Message 2 Track ID / File Name = “TRK0002.mp3” (Discrete Input 2)

Message 11 Track ID / File Name = “TRK0011.mp3” (Virtual Input 11)

File System

Functional Description

VAM modules use the FAT32 file system for all SD card files and support microSDHC type cards only. The SD card may be formatted with different allocation unit sizes (cluster sizes) if desired, but it is recommended to use 8192 byte or 16 kilobyte allocation size due to having a large number of small files.

The directory structure of the SD card is static, explicitly defined, and contains four (4) directories. Do not rename or adjust the directory structure which is detailed in Figure 1.

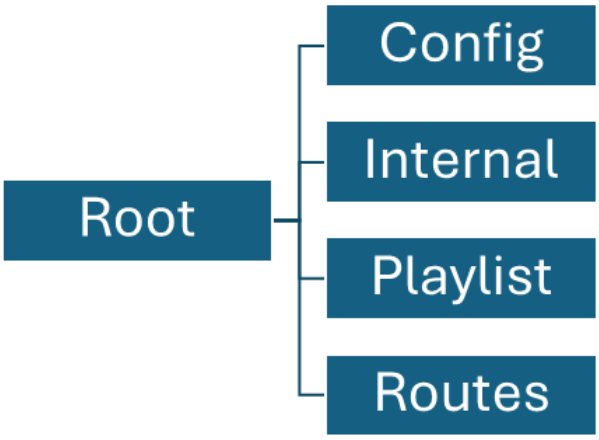


Figure 1—VAM Directory Structure

The lightweight implementation of the file system limits the size of filenames to no more than seven (7) characters, excluding the file extensions. Longer file names will cause errors when searching for the files on the SD card.

NOTE: All file names on the SD card must be seven (7) characters or less with no spaces or special characters, excluding file extensions.

Config Directory

*File Extensions: *.ims*

Contains a single configuration file for the system, messaging, and route configurations. The configuration file located here is generated from the FlexSpeak Programming Utility.

NOTE: Only a single configuration file should exist in the Config directory, otherwise the system may fail to initialize.

Internal Directory

Contains files used in internal testing and diagnostics. Do not load any files in this directory.

Playlist Directory

*File Extensions: *.mp3*

Contains all audio files for the VAM system. Files in this directory must adhere to the 7-character file name limit. All audio files assigned in the configuration utility must be in this directory with a unique file name. There are five (5) audio files which will always be in the Playlist directory and are required for normal system operation.

Playlist Directory - Continued

Required default audio files:

- Chime.mp3
- Chime1.mp3
- Chime2.mp3
- Chime3.mp3
- Rtesel.mp3

NOTE: Do not delete the required files in the playlist directory. If the required files are deleted, the system will not be able to play the associated audio messages during normal system operation.

Routes Directory

*File Extensions: *.rte and *.txt*

The route directory contains the master route definition (Routes.rte) and individual route files (*.txt). The name of the master route definition file should never change. For each route defined in the master route definition, a text file should exist which has a matching name defining the stops for each route. The system uses the master route definition file to look up individual route files within this directory.

Master route definition files are generated from the FlexSpeak Programming Utility.

Route files which contain detailed information for each stop are defined and generated using the Stop Selector Web App configuration utility.

NOTE: Make sure to properly remove the SD card from the PC before use in the VAM module. To properly remove the SD card: Right Click the media and select Eject.

Messaging System

Functional Description

The VAM module messaging system is composed of four (4) hardware triggered messages (Discrete Input Messages) and 56 virtually triggered messages which allow operators to use a combination of buttons, switches, and external message protocols to actuate messages for specific use cases. The configuration of discrete and virtual messages applies at the system level and does not change based on the selected route.

The messaging system FIFO queue allows for adding up to four (4) simultaneous messages which can be any combination of messages triggered through discrete or virtual inputs. When configured as a repeating message, the repeating message will consume one (1) of the available messages even when not actively playing. Once a repeating message trigger is cleared, the resource will be released and available for use by other message inputs.

Discrete Inputs

Four (4) hardware inputs are provided for triggering discrete input messages using buttons, switches, or digitally controlled pulse generators. The input mapping is defined in the Hardware Description and listed in Table 1 for reference. Discrete input messages can be activated on event or level triggers as described in the Discrete Inputs section of this document. Hardware Inputs one (1) through four (4) are mapped to track IDs one (1) through four (4).

Hardware inputs allow transit authorities to customize and configure automatic message playback for events such as doors opening, doors closing, operator button pushes, stop requests, and more.

Virtual Inputs

56 virtual inputs are provided for triggering virtual messages using a LIN master device. The LIN protocol is developed and provided by InterMotive Vehicle Controls and allows control of the 56 inputs with minimal messaging overhead. To use virtual inputs, a separate master device must be purchased, installed, and configured for use with the VAM module. Virtual inputs are mapped to tracks 9-64.

All virtual input triggers are interpreted as level triggers for the purpose of message playback.

For more information about virtual messaging capabilities, please contact InterMotive Vehicle Controls.

Route Management System

Functional Description

The GPS enabled route management system is composed of a GPS module, GPS data processing engine, user defined routes, and a route management engine. The route management system uses GPS data, route file definitions, and route message configurations located on the SD card to determine if the vehicle has triggered or departed a geofence area defined by the user.

Routes can be selected on the vehicle while the system is running by activating, then deactivating, a level trigger on discrete input eight (8). Once in route selection, user defined routes can be selected by activating event triggers on discrete inputs seven (7) and eight (8). The selected route data is then loaded into memory and used to actively search for geofence triggers.

Routes are defined by the user in the order which they are intended to be run, but the system is **capable of running routes in any order**. Any stop for the selected route may be triggered in any order as long as the GPS data shows that a specific geofence is active. When running routes out of order, the sign text will not correctly display the next stop. Future versions intend to fix this by adding a configuration field for specifying the sign text for the next stop.

Once a geofence is triggered, the system will play the arrival chime, queue the arrival audio message (if enabled), and update the sign text with the stop description. While inside the geofence, the route management system will use GPS data to determine if the vehicle has departed the stop.

Once the vehicle is outside the geofence area, the system will play the departure audio message (if enabled), and update the sign text with the next stop. The route management system assumes the sign text for the next stop is the text description for the next stop defined in the route file. After leaving the geofence, the system resumes searching for any defined geofence trigger.

Geofence Triggering Behavior

Vehicle GPS location is updated once per second and compared against all defined stops in the selected route file. The geofence's GPS position, vehicle heading, and stop radius are used to determine if the vehicle is inside a geofence. The stop location, vehicle heading, and stop radius are parameters which are set by the user during route configuration and saved in the route file on the SD card. The system sequentially checks each stop defined in the route file. The first stop found which places the vehicle inside a defined geofence will cause the system to trigger the geofence for that stop.

NOTE: Only one geofence can be active at any given time.

While a geofence is active, the route management system will only use the vehicle position data to determine if the vehicle has departed the active geofence and does not search for entry into a new geofence.

Overlapping geofences are allowed and situations requiring overlapping geofences do occur. Typically, overlap is due to a vehicle stopping in the same location travelling in the opposite direction. In this case, the heading parameter should be specified to prevent spurious triggers of the incorrect geofence.

Geofence Triggering Behavior - Continued

The sequencing for geofence trigger determination is as follows:

1. The vehicle position is compared to the defined geofence location using GPS position data and the stop radius parameter defined in the route file.

2. If the vehicle is within the specified radius of the stop, the vehicle heading is checked and compared against the stop heading defined in the route file.

3. If the vehicle heading matches the heading parameter defined for the stop, the geofence is triggered.

While the vehicle is stopped or travelling at low speeds, the GPS data uncertainties can cause the heading information to be inaccurate. This behavior can cause unintended triggering of a geofence with a defined heading.

A detailed description of all stop configuration parameters can be found in the Stop Configuration Parameters section of this document.

Route Selection

Routes can be selected at any time during normal operation of the system. The current route selection is saved to persistent memory on the VAM module so that the last loaded route can be restored on subsequent system startups.

Entering route selection is accomplished on the vehicle while the system is running by activating a level trigger on discrete input eight (8). Once route selection is entered, the sign will be updated with the text “Select Route” and a timeout timer with a five (5) second duration is started. If the system does not receive input to change the route within the timeout period, the system will exit route selection and load the last saved route into memory. An exception to this occurs during initial system startup after first installation. The system will remain in route select until at least one (1) route is selected.

Once in route selection, user defined routes can be selected by activating event triggers on discrete inputs seven (7) and eight (8). Each event trigger received while in route select will perform the following actions:

- Increment (input 8) or decrement (input 7) the selected route.
- Update the sign with the newly selected route.
- Play an audio message specifying the route selected.
- Reset the route selection timeout timer to five (5) seconds.

To complete route selection, allow the route selection timeout timer to expire. Once the timer expires, the selected route data is loaded into memory and used to actively search for geofence triggers. The loaded route will be displayed on the sign until route selection is entered again, or a geofence trigger is reached.

Route selection audio files are placed in the playlist directory and must contain a file name that matches the name of the route defined in the master route definition file (Routes.rte). For example, a route name of “NORTH” in the master route definition file will have a file named “NORTH.mp3” in the Playlist directory. If the route audio file is not located in the Playlist directory, no audio will play when selecting the route.

Running Routes

Running routes is the normal state of the route management system. Route data is loaded automatically during system initialization using the save route, or after completing route selection. Behavior of the system while running routes follows that described in the Route Management section of this document.

Stop Configuration Parameters

Stop Name (Stop Description)

Detailed description of the stop. This parameter contains the text that is displayed on the sign. When arriving at a stop, the text "ARRIVING: " is prepended to the stop description. When departing a stop, the text "NEXT: " is prepended to the stop description.

Heading (Bus Movement Direction)

Defines the compass heading used by the geofence calculation to determine if a geofence trigger is activated while in the stop radius. All heading options allow for some heading error to ensure the system triggers the stop. The allowed heading error is +/- 55 degrees from the specified heading. Five options are provided for the user to select.

- No heading required (-): When no heading option is specified, the geofence will always trigger when the vehicle is within the specified stop radius.
- North (N): Use this option for specifying North, North by Northeast, and North by Northwest headings.
- South (S): Use this option for specifying South, South by Southeast, and South by Southwest headings.
- East (E): Use this option for specifying East, East by Northeast, and East by Southeast headings.
- West (W): Use this option for specifying West, West by Northwest, and West by Southwest headings.

The shaded region of Figure 2 shows the allowed error for a selected heading of East.

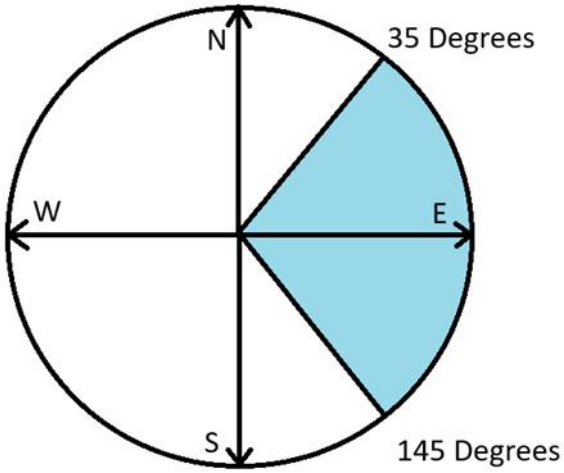


Figure 2 - Visualization of Heading Error Allowance

Stop Configuration Parameters - Continued

Geofence Radius

Defines the size of the geofence area as a radius in feet. This is an integer parameter and is used in conjunction with the latitude and longitude parameters to determine if the vehicle is within a specified geofence.

Default value: 200 ft.

Allowed range: 1-9999 ft.

The minimum value of the radius is not restricted, however, best system performance is achieved when the minimum radius is no less than 25 feet. This restriction is due to the uncertainty of the GPS module which is approximately +/- 15 feet.

For stops located under obstacles which block the GPS receiver (bridges, overpasses, etc.), use a larger radius than necessary to trigger the geofence before the GPS signal is blocked.

Latitude and Longitude

Defines the centroid of the GPS geofence location for a stop within a route, and is set in the Bus Stop Web Application. The text field is not directly editable by the user and is inserted from the app using the position selected on the map by the user.

System Configuration

Configuration Overview

System configuration is accomplished using two (2) main tools provided by InterMotive Vehicle Controls and third-party software for audio file creation. The tools provided by InterMotive are the FlexSpeak Programming Utility and Stop Selector Web Application.

The general steps to perform system configuration are as follows:

1. Define the master route definition file in the FlexSpeak Programming Utility.
2. Define all the stops for each route to be loaded onto the SD card using the Stop Selector Web Application. This step will generate route files containing detailed stop information for each route.
3. Create the necessary audio files for arrival and departure messages. The recommended tool for creating audio files is VoiceMaker.
4. Create the necessary audio files for route selection.
5. Create the necessary audio files for input messages.
6. Use the FlexSpeak Programming Utility to create the system configuration file for all system configuration, message configuration, and route audio configuration options.
7. Load all files onto the SD card.

SD Card

Ensure that you have followed all file naming conventions specified in this document for the system to function correctly.

Ensure that your SD card is an SDHC type, and is formatted with the FAT32 file system.

Verify the SD card contains the directory structure specified in the File System Description.

Load the files on the SD card from your PC. Ensure that you follow the requirements for file locations specified in the File System Description.

After loading all configuration, route, and audio files from your PC, insert the SD card into the VAM module.

NOTE: The microSD card must be inserted with the contacts facing down. If the card is inserted upside down then it may become stuck in the connector or break the connector.

Insert with contacts facing down →

Bus Stop Web App

The Bus Stop Web Application is used for defining stops in a route. The application provides an interface utilizing google maps integration to select stop locations, populate a list of stops, and configure the stop parameters for a route. This is an online only tool.

Detailed instructions for using the Stop Selector Web App are found in the application instructions contained in the web app.

After Saving the route file from the web app, rename the file with the appropriate route name which matches the name from the master route list and place the route file into the "Routes" directory on the SD card.

Audio File Creation

Audio Recording Tools

To create Talking Bus audio messages, you will need:

- **VoiceMaker Text-to-Speech Converter website (purchase)**

  This website will convert any typed text into natural sounding speech, which can be downloaded into MP3 audio files. To access the recommended voices suitable for Talking Bus, you will need to purchase a Premium plan.

Audio Recording Instructions - VoiceMaker

INITIAL SETUP

1. Go to https://voicemaker.in/pricing.
2. To purchase the Premium Plan, click on "Get Started."
3. Register with name, email, and password.
4. Pay for the Premium Plan using a credit card.

   NOTES:
   - If you want to continue using VoiceMaker after 30 days, you can re-purchase the plan on a month-to-month basis.
   - The free plan is not recommended. The voices sound robotic and are not suitable for Talking Bus.

Instructions

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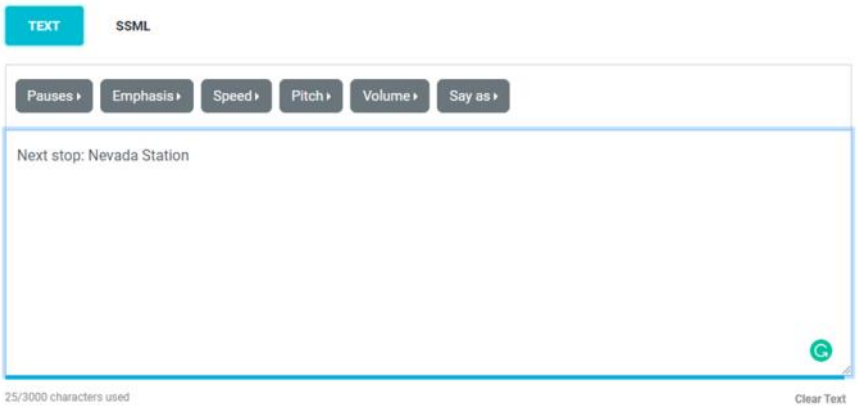
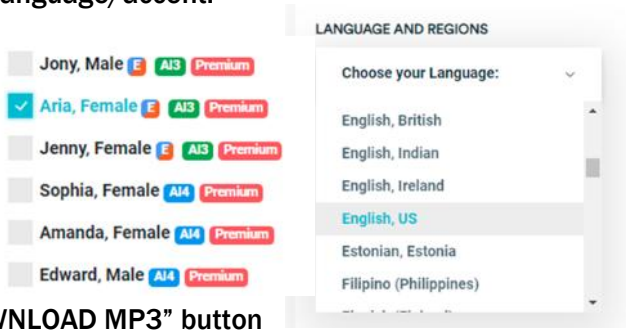
HOW TO CREATE AUDIO FILES

1. Go to https://voicemaker.in/.
2. Log in so you can access the premium voices.
3. Type the text that you want to convert to speech (up to 3,000 characters for each recording). For example, type "Next stop: Nevada Station" or "Now stopping at Nevada Station."
4. Below the text box, under "AI ENGINE" select "Neural TTS" for more natural-sounding voice options.



5. Under "LANGUAGE AND REGIONS" choose your preferred language/accent.
6. Under "VOICES" select a Premium voice for best quality and most natural-sounding speech. Recommended (English, US): Aria, Female, or Jony, Male
7. Click on the "CONVERT TO SPEECH" yellow button to hear the spoken text. The Premium Plan has unlimited conversions.



8. If you are satisfied with the spoken text, click on the "DOWNLOAD MP3" button and save the audio file to your computer. You may use up to seven (7) numbers and letters for the file name. To adjust the settings, continue to Steps 9 - 12.
9. Above the text box there are adjustable settings. Highlight the word(s) to adjust and select:

- **Voice Effect:** breathing, soft or whispered.
- **Pauses:** 0.5+ seconds between words. There is a 0.2 second pause between each line of text.
- **Emphasis:** Strong, moderate or reduced.
- **Speed:** Five (5) options, extra slow to extra fast.
- **Pitch:** Six (6) options, extra low to extra high.
- **Volume:** Five (5) options, extra soft to extra loud.
- **Say as:** Multiple options - address, phone, spell out, cardinal (counting), ordinal (in order), characters (spell each letter), digits (spell each number) and fractions.

10. Adjustments can also can be made using "AUDIO SETTINGS," "VOICE SETTINGS" and "VOICE EFFECTS" (depending on voice selection).

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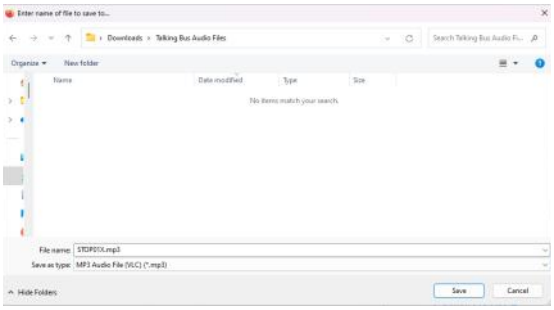
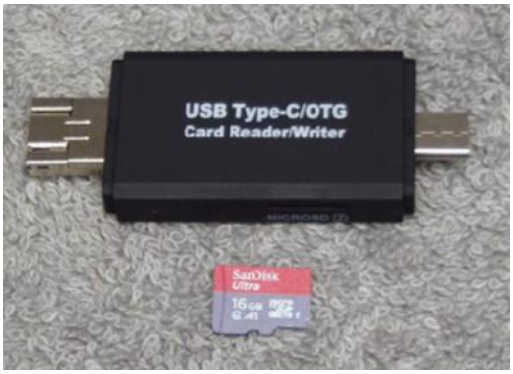
Audio Recording Instructions - VoiceMaker (continued)

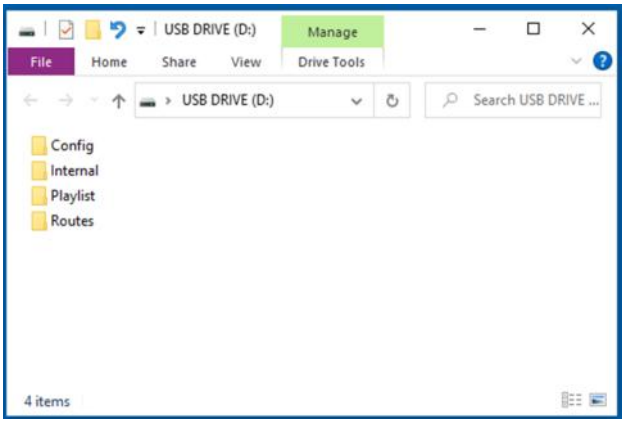
11. Once you have adjusted your settings, click on the “CONVERT TO SPEECH” yellow button to hear the audio. Adjust and convert as many times as needed.
12. To save, click on the “DOWNLOAD MP3” button and save the audio file to a master folder on your computer. You may use up to seven (7) numbers and letters for the file name. Create as many files as necessary and save it to this master folder. This folder can be used to keep track of all audio files and can be used to quickly copy to the microSD cards in all modules.



13. Insert the FlexSpeak microSD card into the provided card reader (adapter), then insert the reader into a USB or USB Type-C port on your computer.



14. Navigate to the USB drive and click on the “Playlist” folder.
15. Open the master folder with the audio files. Copy and paste the files into the Playlist folder on the USB drive.



Updating microSD Card Files

You will need:

- **SD Card Adapter**

  One SD card adapter is included with the purchase of Talking Bus.

- **MicroSD Card**

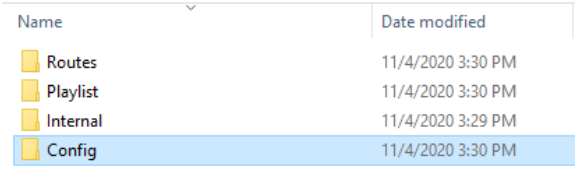
  One microSD card is included with each Talking Bus module. If using a new microSD card, please ensure it has a storage capacity between 2GB and 32GB and is formatted in FAT32.

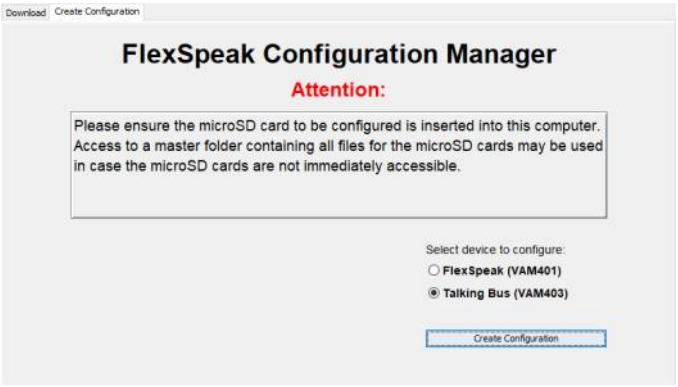
- **FlexSpeak Programming Utility and Bus Stop Web App**

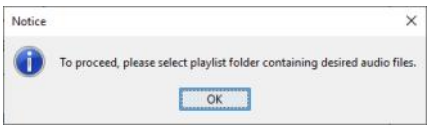
  The FlexSpeak Programming Utility and Bus Stop Web App are two programs used to update the microSD card files. Both can be found here on the InterMotive website in Support > Tech Support > Downloads.

Updating Config File

1. Insert microSD card into adapter and then insert adapter into computer.
2. Double click on “Config” folder to ensure that desired config file is present to be updated.
3. If new config file has already been created, skip to step 8.
4. Open the FlexSpeak Programming Utility, click the “Create Configuration” tab on top, click “Open Folder” and navigate to the “Playlist” folder on the microSD card. Select “Talking Bus (VAM403)” and click “Create Configuration.”
5. Create new route list by typing in names of all routes or click on “Load Route List” to modify an existing file. The “Special” route will always be last.
6. Press “Next” and the following prompt will show. Click “OK” and then select the “Playlist” folder on the microSD card.







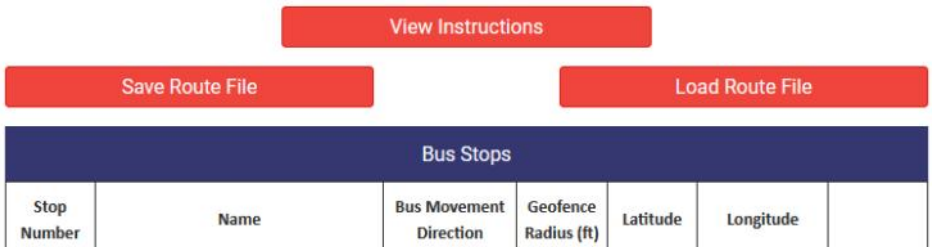
Instructions

Updating Config File (Continued)

7. Click on “File” and “Load Configuration.” Navigate to the config file located on the microSD card.
8. Modify parameters as necessary.
9. Special functions:
   - “Insert Stop” and “Delete Stop.” These are used to add a new stop along the route or to delete a stop that will no longer be active.
   - “Disable Messages” and “Enable Messages.” These are used to set only arrival or departure audio messages to trigger.
10. Save new config file in the “Config” folder. Please ensure the new config file is now the only file in the “Config” folder.

Updating Route Files

1. Insert microSD card into adapter and then insert adapter into computer.
2. Double click on “Routes” folder to ensure that desired routes file is present to be updated.
3. Open the Talking Bus Web App either through the FlexSpeak Programming Utility or directly through the InterMotive website.
4. Click the “Load Route File” button and select one of the existing route files within the “Routes” folder.



5. Modify bus stops and other parameters as necessary. Follow instructions on the web app by clicking on “View Instructions” for more details.
6. Save new route files in the “Routes” folder. Please ensure each old route file has been replaced by its corresponding new version in the “Routes” folder.

Instructions

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Updating Audio Files

1. Please refer to Audio Recording Instructions for recording new audio.
2. Insert microSD card into adapter and then insert adapter into computer.
3. Double click on “Playlist” folder.
4. Save newly recorded audio files in the “Playlist” folder.
5. Please ensure the following are not deleted:

   Chime.mp3

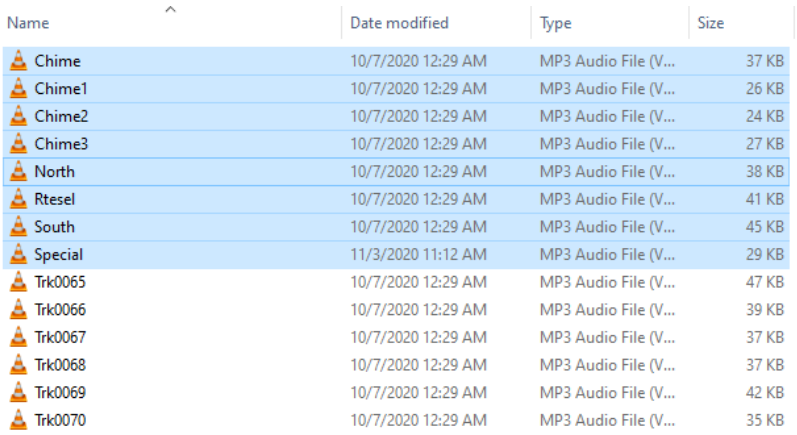
   Chime1.mp3

   Chime2.mp3

   Chime3.mp3

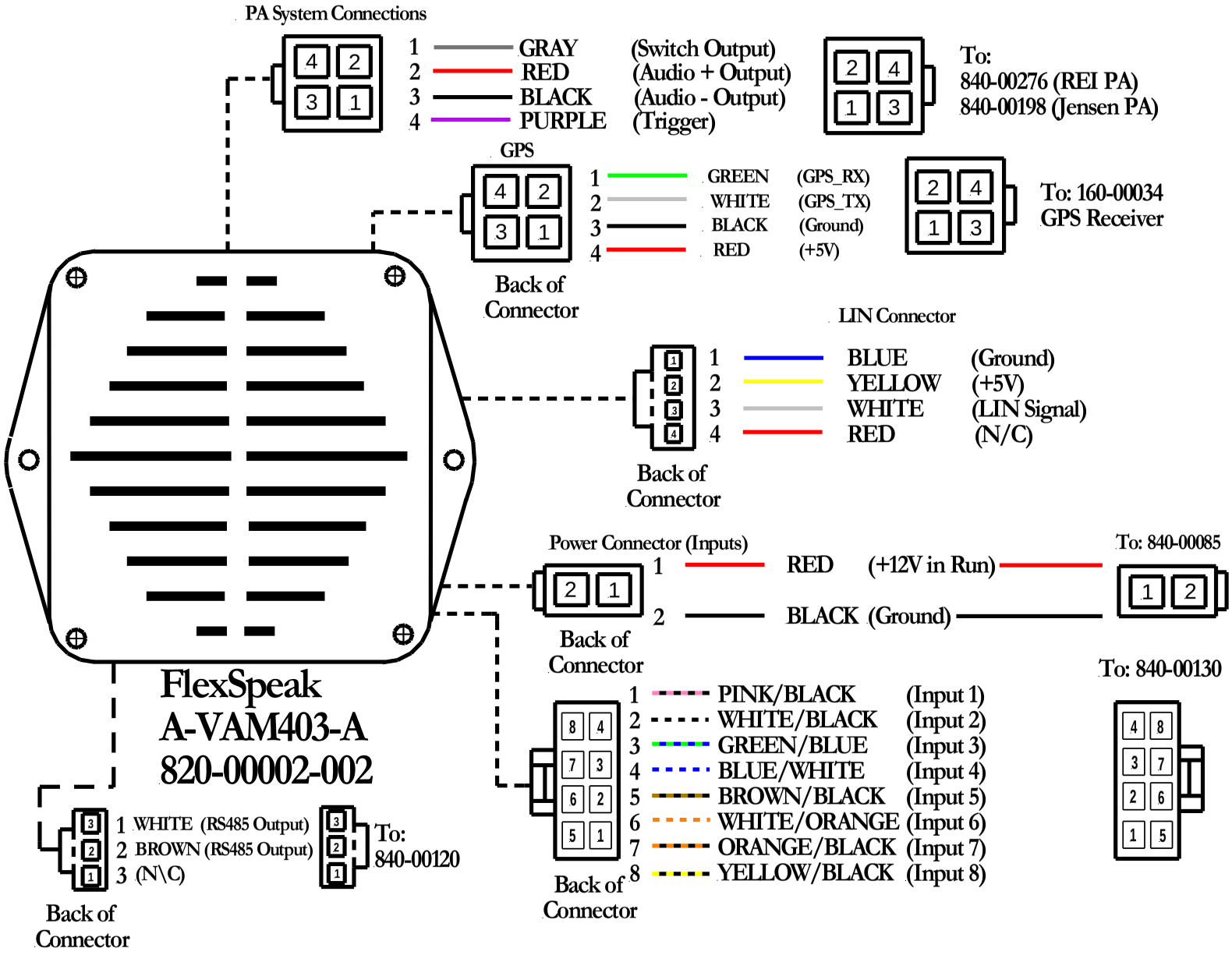
   Rtesel.mp3

   Any audio files pertaining to route names



Name	Date modified	Type	Size
Chime	10/7/2020 12:29 AM	MP3 Audio File (V...	37 KB
Chime1	10/7/2020 12:29 AM	MP3 Audio File (V...	26 KB
Chime2	10/7/2020 12:29 AM	MP3 Audio File (V...	24 KB
Chime3	10/7/2020 12:29 AM	MP3 Audio File (V...	27 KB
North	10/7/2020 12:29 AM	MP3 Audio File (V...	38 KB
Rtesel	10/7/2020 12:29 AM	MP3 Audio File (V...	41 KB
South	10/7/2020 12:29 AM	MP3 Audio File (V...	45 KB
Special	11/3/2020 11:12 AM	MP3 Audio File (V...	29 KB
Trk0065	10/7/2020 12:29 AM	MP3 Audio File (V...	47 KB
Trk0066	10/7/2020 12:29 AM	MP3 Audio File (V...	39 KB
Trk0067	10/7/2020 12:29 AM	MP3 Audio File (V...	37 KB
Trk0068	10/7/2020 12:29 AM	MP3 Audio File (V...	37 KB
Trk0069	10/7/2020 12:29 AM	MP3 Audio File (V...	42 KB
Trk0070	10/7/2020 12:29 AM	MP3 Audio File (V...	35 KB

6. If any of the required files are deleted, please re-record or replace them.



Submit product registration at www.intermotive.net

If the VAM403 fails any step in the Post Installation Check List, review the installation instructions and check all connections. If necessary, call InterMotive Technical Support at (530) 823-1048.