Installation of Controlling Access Management Unit (AIM2.4)

FuelMaster AIM2.4 Access Management Units (AMUs) are Fuel Management Units (FMUs) installed and configured to control or monitor access by detection of an AIM2.4 Automotive Information Module installed in the vehicle attempting access. AMUs were previously referred to as access points. AMUs may be controlling (to activate a car wash, gate opener, or other device), or monitoring (to record entry and/or exit through an entry point). These instructions are for a controlling AMU.

The most common applications for controlling AMUs are to control and record access to a car wash, or access through a secure gate. Other applications are possible. AMUs may be installed to control and record access from one direction, or from both directions.

IMPORTANT!

AIM2.4 AMUs may be accessed with AIM2.4, and may be configured keyless to also accept Keypad, or Proximity Card, or Vehicle Prokee/Smartcard access (it will not accept User Prokees/Smartcards).

AMUs will not activate from vehicles installed with analog AIMs.

Vehicles with AIMs having an external antenna will be detected by the AMU sooner than a vehicle with an AIM having an internal antenna.

A controlling AMU may only be configured from a complete FMU.

Collector antennas are the omni-directional antennas/radios installed on the AMU for fueling purposes.

Beacon antennas are directional antennas installed to only authorize vehicle access at a specified point before the device being accessed.

Required firmware

Firmware Type	Firmware Version
AIM	v2.09 or later
FMU	v3.85c, or 3.86b or later
RIB (Radio Interface Board)	v1.03 or later

Components

Some components are duplicated when control from both directions is used. The quantities of components listed below can be referenced to 1D for one direction, or 2D for both directions:

FMU-3505PLUS FMU with 941H0500 2.4 GHz Access Management Kit (1D-One Direction) or 941H0500A 2.4 GHz Access Management Kit (2D-Both Directions)

Part #	Part Description	Amount
941B0839A	Bracket, Dual Directional, 2.4 Radio, Pouch (Figure 3) Bracket mounted in AMU upper cabinet to support RF Shield Pouch for radio(s) for Beacon antenna(s)	1
941B0571K	External Radio, Ext Antenna, 6 Pin, Alt Assy (see Figure 1) Beacon Antenna Radio(s) installed in RF Shield Pouch in AMU upper cabinet	1D – 1 each 2D – 2 each
941B0581K	Label, Ext Rad, AIM, ETL, Ext Ant, 6 Pin, Alt (see Figure 1) Equipment label with ETL certification mark (1D-1 each, 2D-2 each)	1D – 1 each 2D – 2 each
262508	Cable, MMCX Plug to TNC Jack, 3 inch (see Figure 1) Cable that connects between 941B0571K radios and Attenuator	1D – 1 each 2D – 2 each
262516	Cable, TNC Plug to Bulkhead TNC Jack, 12 inch (see Figure 1) Cable that connects between Attenuator(s) and RIB (Radio Interface Board)	1D – 1 each 2D – 2 each
262524	Attenuator, TNC, DC to 2.5 GHz, 50 ohm, 40 db (see Figure 1) Device to reduce the output signal power of the Beacon antenna radios	1D – 1 each 2D – 2 each
262532	Antenna, Panel, 19dbi Gain, 2.4 GHz (see Figure 2) Beacon directional antenna used to focus signal on designated entry or exit point	1D – 1 each 2D – 2 each
262556=10 Ft, 262556A=20 Ft, 262556B=30 Ft, 262556C=50 Ft, 262556D=Custom Length (specify desired length)	Beacon Antenna Cable, N Right Angle Plug to TNC (Not Shown)	1D – 1 each 2D – 2 each
262540	RF Shield Pouch, Custom, 2.4 GHz, Access Point Shield to prevent 941B0571K radios from emitting signals through any means other than Beacon antenna	1
244414	Rivet Nut, 10-32, 0.02 x 0.13 Secures 262540 RF Shield Pouch to 941B0839A Bracket	2
262548	Flat Vinyl Plastic Grip, 3.25 in x 2 in x 0.25 in, Black (see Figure 1) Vinyl protective sleeve for 941B0571K radios in RF Shield Pouch	1D – 1 each 2D – 2 each
	Electrical Tape (user bought) After radio is inserted in 262548 grip, used to secure radio in grip	As required

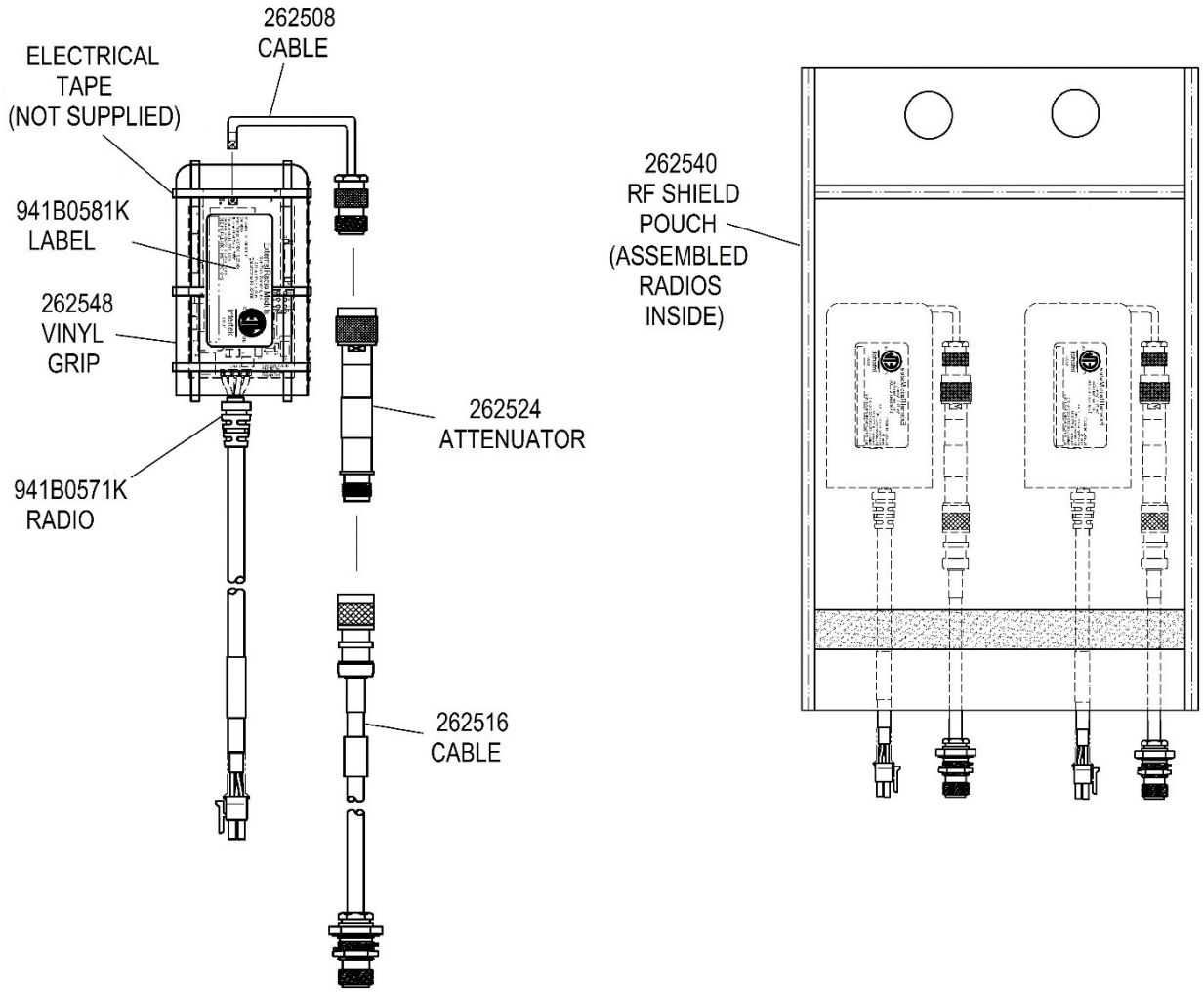

Figure 1. Controlling AMU Components (Partial Showing)

Figure 2. 262532 Beacon Antenna and Hardware

Figure 3. 941B0839A Bracket, Standalone and With RF Pouch

Scenario: ingress (Figure 4) or Ingress/Egress (Figure 5)

- As an AIM2.4 equipped vehicle approaches the car wash or secure gate, the AMU Collector Antenna (mounted on the FMU-3505PLUS AMU) recognizes the approaching vehicle, and the vehicle AIM recognizes the AMU is configured as a controlling AMU.
- The vehicle moves into the Beacon Antenna signal before the car wash or gate, and stops. The vehicle must come to a complete stop. The vehicle AIM sends its ID to the AMU, and the AMU determines the vehicle is authorized.
- In 10 seconds, the car wash or gate is activated, if the vehicle is authorized.
- The vehicle starts moving through the car wash/gate. The AMU gathers vehicle information from the AIM including vehicle ID, odometer, etc., and builds a transaction.
- As the vehicle continues through the car wash/gate, the AIM times out and the transaction is complete.

Control from One Direction

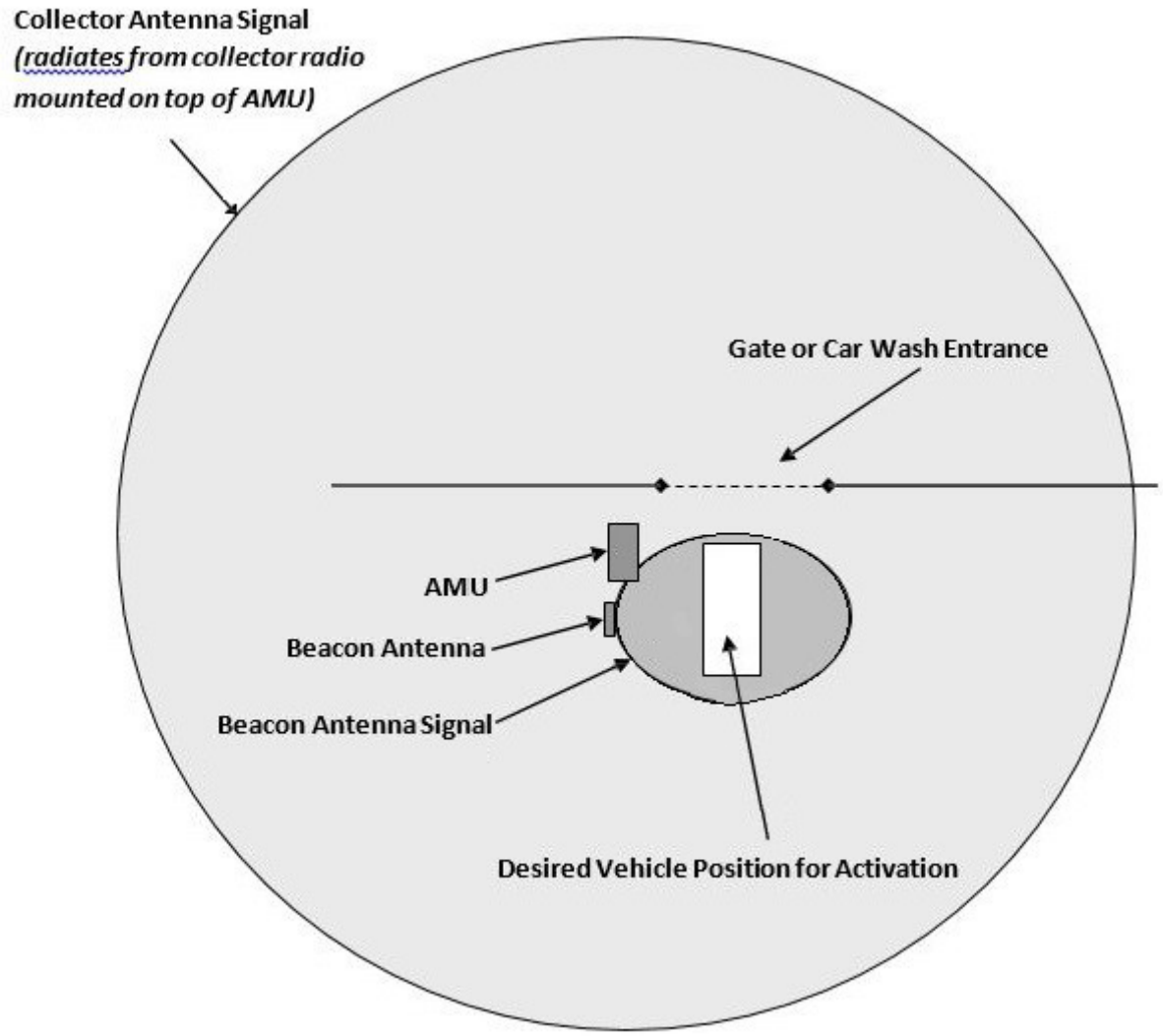

Figure 4. Overhead View of Control from One Direction Only

Control from Both Directions

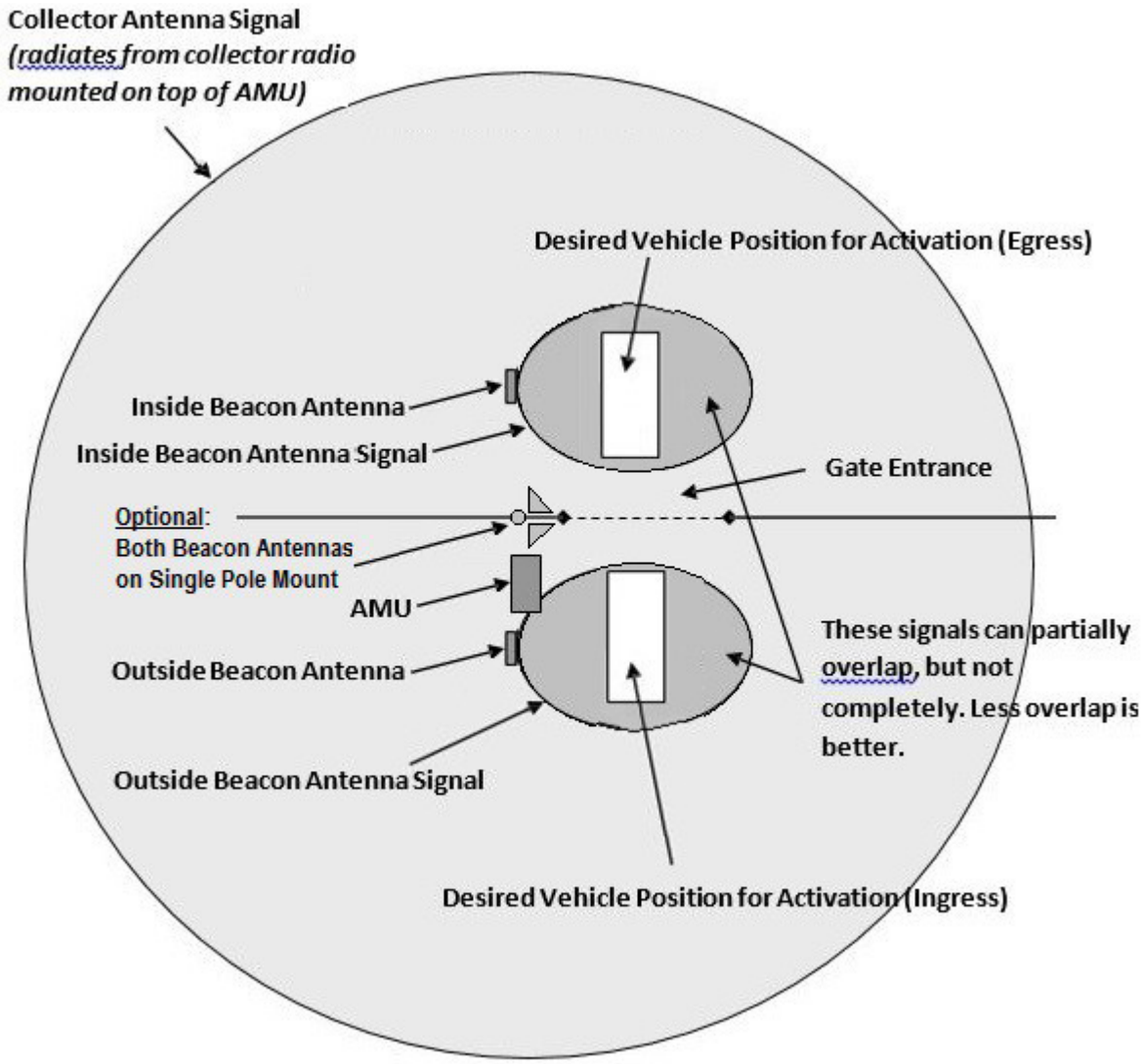

Figure 5. Overhead View of Control from Both Directions

Equipment Installation

An FMU-3505 must be installed in accordance with the FMU Installation Manual. The FMU-3505 must be in close proximity to the desired ingress/egress point. An AMU kit must be installed in the FMU, and a beacon antenna(s) must be installed nearby and connected to the FMU-3505 through conduit. Perform the following:

1. Verify an FMU-3505 is installed to accept the AMU parts, and in close proximity to the gate or car wash.
2. Verify availability of a mounting location for the beacon antenna(s).
3. Remove AMU power at the FMU ON/OFF switch.
4. Unlock and open the AMU upper cabinet and pedestal doors.

5. Install conduit from the beacon antenna mount location(s) to the AMU. If not in proximity to a hazardous fueling location, the conduit need not be explosion-proof rigid metal. Note the size of the connectors on the antenna cable. The conduit must accept the antenna connectors.
6. Refer to Figure 2 and the documentation supplied with the flat panel beacon antenna for assembly and use of the mounting hardware. Temporarily mount the beacon antenna(s) so that it is pointed down to the desired position for activation of the gate or car wash.

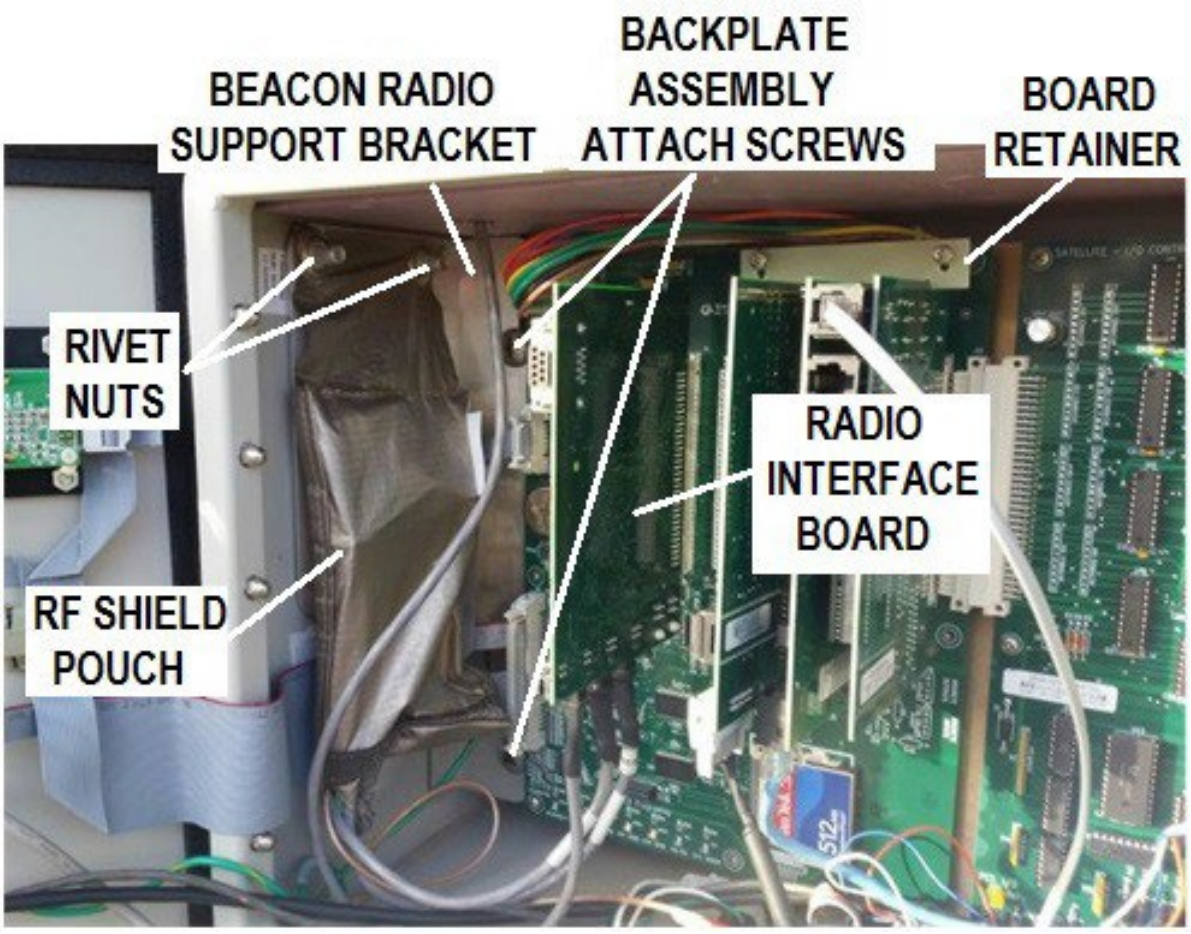

Figure 6. Install Radio Interface Board (RIB) and Beacon Radio(s)

7. Loosen the two Board Retainer screws and raise the Board Retainer.
8. Install the Radio Interface Board (RIB) in an unused Mainboard expansion slot.
9. Lower the Board Retainer over the RIB and tighten the two screws.
10. Remove the two large 3/8-16 screws from the left side of the AMU Backplate Assembly and, using the two screws, attach the beacon radio support bracket (see Figure 3) through the two attach holes.
11. Reference Figure 6. Suspend the beacon radio pouch assembly from the support bracket, and secure with two rivet nuts. Refer to the circled numbers in Figure 7, and perform the following to prep the beacon radio(s):
    a. In step 1 of Figure 7, obtain the 262548 black vinyl sleeve supplied with the AMU kit and use a knife to cut the side edge open from top to bottom.

b. In step 2, obtain the 941B0571K radio(s) and attach the 262508-adapter cable to the small MMCX receptacle on the radio. The connection is a quick disconnect and locks in place by pushing the plug into the receptacle.

c. In step 3, insert the radio and adapter cable into the black vinyl sleeve. One side of the sleeve was cut open to permit the adapter cable to exit through the side of the sleeve.

d. In step 4, secure the radio in the sleeve by wrapping with electrical tape as shown in the figure.

e. After the electrical tape is wrapped, apply the 941B0581K ETL label as shown in the figure.

f. Attach the 262524 Attenuator to the 3-inch adapter cable.

g. Attach the 262516 cable to the Attenuator.

h. Repeat as necessary for the second radio.

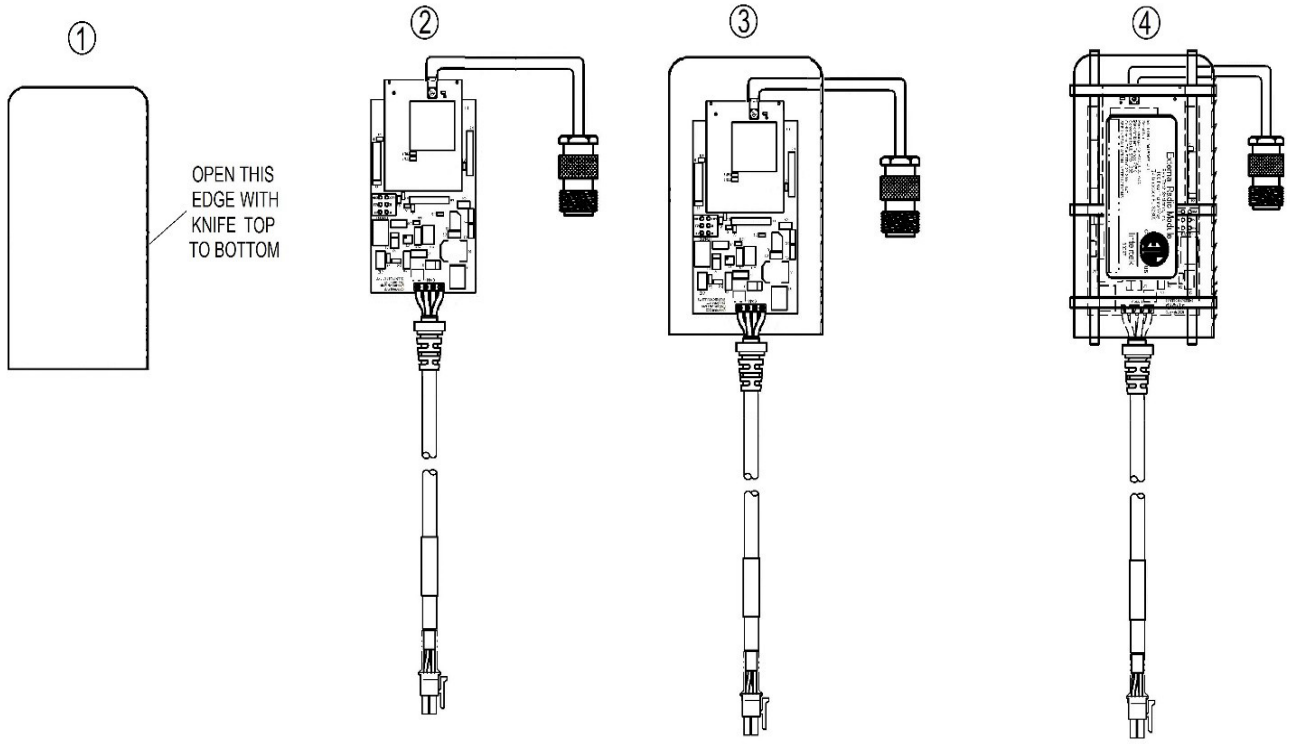

Figure 7. Prepping Beacon Radio(s) for Install in RF Pouch

12. Refer back to the drawing in Figure 1. Insert the radio(s) into the RF pouch as shown. The RIB connector and antenna cable connector should be protruding from the RF pouch. There should be enough RIB connector cable to reach to the RIB.

13. Secure the radio(s) in the RF pouch by closing and securing with Velcro as shown in Figure 6.

14. Run beacon antenna cable(s) (STS 262556, 262556A, 262556B, 262556C, or 262556D) through conduit to AMU.

15. Route beacon antenna cable(s) to RF pouch, and connect to 262516 cable(s) attached to beacon radio(s) and protruding from RF pouch.

16. See Figure 8. A RIB (Radio Interface Board) should already be installed in the FMU-3505, and the collector radio(s) should be plugged into 4-pin ports A, if only one collector radio, and B, if two collector radios.
17. See Figure 9. Plug 6-pin beacon radio cable into port C on the RIB if ingress transactions will be recorded (vehicle is entering through the gate), and/or port D if egress transactions will be recorded (vehicle is exiting through the gate).
18. Switch the AMU ON/OFF switch to ON.
19. Verify the AMU initializes and runs self-tests on all installed boards in the mainboard expansion slots.

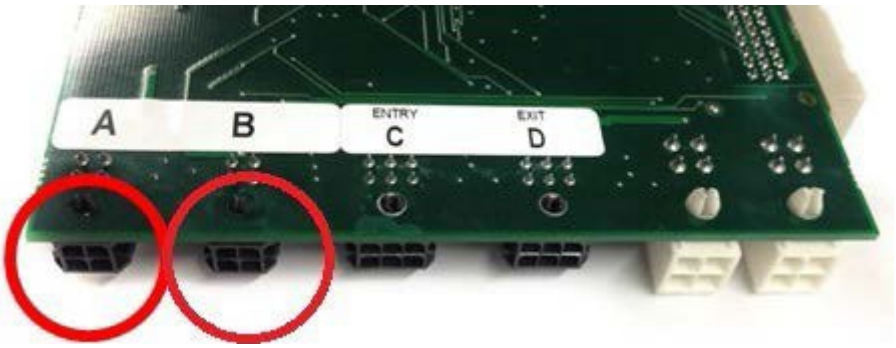

Figure 8. Collector Radio Ports in RIB

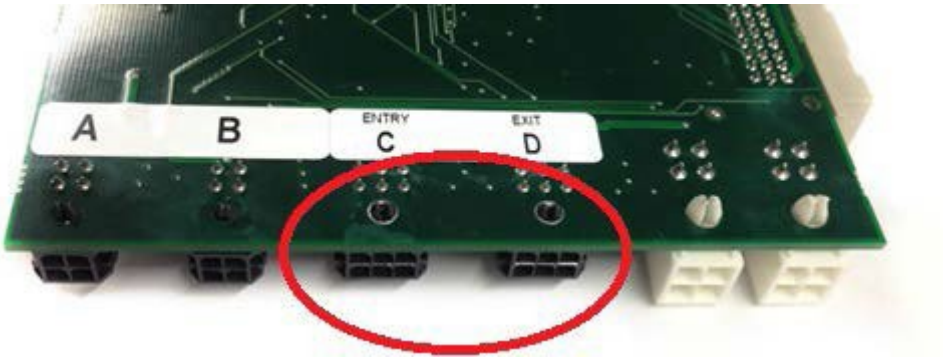

Figure 9. Beacon Radio Ports in RIB

20. When the AMU completes initialization, the following default display should be observed:

```
**FuelMaster FUELS ACCOUNTING SYSTEM**
**        INSERT KEY OR CARD TO BEGIN        **
```

21. Close and lock the AMU pedestal door.

AMU Configuration

1. Make a laptop connection to the AMU in accordance with PB-111 to configure the AMU.
2. Enter Procomm command “BA”. The following display should be observed:

```
CURRENT ACCESS POINT CONFIGURATION

-----------------------------------

** ACCESS POINT STATUS: READY **


ACCESS POINT: DISABLED

ACCESS POINT TYPE: Controlling

MONITORING TYPE: Bidirectional

GET CHRONOMETERS: DISABLED

GET TROUBLE CODES: DISABLED

GET OBD EXTENDED DATA AND COB: DISABLED


USAGE - <SPACE>=CHANGE VALUE, <ENTER>=NEXT FIELD, <ESC>=EXIT
```

3. Highlight the property to change and depress the space bar to:
   a. Set “Access Point” to ENABLED (choices are ENABLED or DISABLED).
   b. Set “Access Point Type” to Controlling (choices are Controlling or Monitoring).
   c. Disregard “Monitoring Type” as it is not applicable.
   d. As desired, enable “GET CHRONOMETERS”,
   e. As desired, enable “GET TROUBLE CODES”,
   f. As desired “GET OBD EXTENDED DATA AND COB “(COB is Configuration Option Bitmap; a bitmap of configurable options stored in the AIM module).
4. Depress Esc to Exit the BA command.
5. Disconnect the laptop connection in accordance with PB-111.

Test Procedure

Vehicles having AIM modules with external antennas will be recognized by collector antennas from a farther distance. You can assume these vehicles may respond differently to beacon antennas. If you have a mix of vehicles with both internal and external antennas, it is recommended the following tests be performed with vehicles with both internal and external AIM antennas.

Ingress

1. Unlock and open FMU pedestal door and turn off FMU ON/OFF switch.
2. If applicable, unplug beacon radio from RIB port D. Ensure beacon radio is plugged into RIB port C.
3. Turn FMU ON/OFF switch ON.
4. Obtain a vehicle with an authorized AIM. Make sure the AIM is not connected as analog, and that it selects a vehicle interface.
5. Drive the vehicle to the desired position for activation of the gate or car wash.
6. Stop the vehicle completely.
7. The gate or car wash should activate within 10 seconds.
8. Once the gate or car wash is activated, start driving (driving is necessary for the transaction to be recorded).
9. Verify that the transaction was recorded in the FMU. There should only be one transaction for GATED INGRESS.
10. Drive out of range of the collector antenna(s) (the orange LED will stop blinking and turn off).
11. Park in several places where you don't want activation and make sure the gate or car wash is not activated.
12. Turn off FMU power, plug beacon radio back into RIB port D, and turn FMU power ON.
13. Close FMU pedestal and upper cabinet doors. Ingress Test Procedure complete.

Egress

1. Unlock and open FMU pedestal door and turn off FMU ON/OFF switch.
2. Unplug beacon radio from RIB port C. Ensure beacon radio is plugged into RIB port D.
3. Turn FMU ON/OFF switch ON.
4. Obtain a vehicle with an authorized AIM. Make sure the AIM is not connected as analog, and that it selects a vehicle interface.
5. Drive the vehicle to the desired position for activation of the gate.
6. Stop the vehicle completely.
7. The gate should activate within 10 seconds.
8. Once the gate is activated, start driving (driving is necessary for the transaction to be recorded).
9. Verify that the transaction was recorded in the FMU. There should only be one transaction for GATED EGRESS.
10. Drive out of range of the collector antenna(s). The orange LED will stop blinking and turn off.

11. Park in several places where you don't want activation and make sure the gate or car wash is not activated.
12. Turn off AMU power, plug beacon radio back into RIB port C, and turn FMU power ON.
13. Close AMU pedestal and upper cabinet doors. Test Procedure complete.

Troubleshooting

1. Gate or car wash doesn't activate when it's supposed to. Possible causes:
    a. The AMU is not connected to the gate or car wash correctly. This is the case if the AMU LCD says the gate or car wash should be opening but it isn't.
    b. The AMU is not configured correctly. Make sure it is configured correctly (see AMU Configuration).
    c. The AIM can't detect the collector antennas. This is the case if the AIM's orange Access Point LED is not blinking before stopping at the gate or car wash. Note: If the LED cannot be seen due to the location of the AIM, log into the AIM and run the STATE command. The AMU Comm State should be ACCESS POINT. Things to try:
        1) Make sure the RIB has the correct firmware version (must be at least v1.03). Log into the AMU to check the version.
        2) Make sure the AIM has the correct firmware version. Log into the AIM to check the version.
        3) Make sure the collector radios were detected when the AMU powered up.
        4) Make sure the collector radios are set to channel unique to any other FMU in the area (including fueling FMUs).
        5) Make sure the collector radios are set to high enough transmit power level.
        6) If all of the above check out, the RIB, collector radio, and/or the AIM may need to be replaced.
    d. The AIM can't detect the beacon antenna.
        1) Make sure the RIB has the correct firmware version (must be at least v1.03). Log into the AMU to check the version.
        2) Make sure the beacon antenna is connected to the beacon radio and is in turn connected to the RIB as described in the Equipment Setup and Radio Interface Board (RIB) Installation section.
        3) Increase the transmit power level of the beacon radio.
    e. The AIM is locked out. Remove the AIM from the lockout list.
2. Gate or car wash activates when it's not supposed to, or an extra transaction is generated for the wrong direction. This means that the Beacon Antenna Signal is too large and/or in the wrong location. Decrease the transmit power level of the beacon radio or move the antenna. Moving the antenna higher also might help if the undesired activation is occurring when the vehicle is behind the antenna.

3. Gate or car wash activates but no transaction is recorded at the AMU after the vehicle starts driving. This is the case if the AIM and AMU can't communicate with each other after the gate or car wash is activated and the vehicle starts driving. Make sure the transmit power level of collector radio(s) is set to a high enough value. If that checks out, the RIB, collector radio, and/or the AIM may need to be replaced

Adjusting Transmit Power Level (TPL)

Too much or too little transmit power, referred to as the Transmit Power Level (TPL), will affect the performance of the beacon and collector radios, and can be adjusted with a laptop connection to the AMU. Too much power will pick up AIM vehicles outside the desired range of the radios. Too little will not always pick up AIM vehicles inside the desired radio range. Be careful with this if you have a mix of AIMs with both internal and external antennas. AIMs with external antennas will be recognized at farther distances.

The default TPL is set at the highest level of 31. In some cases, it may be necessary to decrease the power level or, if the TPL has already been adjusted, increase the power level. The TPL may be adjusted separately for the beacon and collector radios as follows:

1. Make a laptop connection to the powered AMU in accordance with PB-111.
2. Enter Procomm command "B9". The following screen will be displayed:

```
AIM STATUS MENU

-------------------------------

1.  Display AIM Stats

2.  Display Current RF Channel(s)

3.  Get FRB or RIB Version Number

4.  Monitor AIM Communications

5.  Display Current RIB Transmit Power Level

6. Display Current RIB radios

99. Advanced AIM Debug Menu Make Selection:
```

3. Select 99. Advanced AIM Debug Menu:

AIM ADVANCED DEBUG MENU

---

1. Reset processor on FRB or RIB
2. Unused
3. Set RF Channel
4. View/Change Status Poll Settings
5. Display Current RSSI Readings (Gen1 radios only; takes 70 seconds)
6. Monitor hose status change messages
7. Control Access Point Radios
8. Monitor programming hose tag
9. Monitor real-time AIM transactions
10. Clear FRB saved good RF channels (Gen1 radios only)
11. Set FRB and/or RIB saved good RF channels
12. Test FMU <-> RFRB communication
13. List Query Stats
14. Set RIB Transmit Power Level.
15. View saved good RF channels
99. FMU RF test mode Make Selection:

4. Select 14. Set RIB Transmit Power Level:

Select which RIB radio type:

RIB collector

RIB beacon

Selection:

Current transmit power levels: RIB Collector TPL = 6.

RIB Beacon TPL = 10.

5. Select 1. RIB collector, or 2. RIB beacon, as needed:

```
Select which RIB radio type:

------------------------

RIB collector

RIB beacon


Selection: 1

Current transmit power levels: RIB Collector TPL = 6.

RIB Beacon TPL = 10.


Enter new collector power level [0 - 31]:
```

6. Enter new collector power level (example: 10):

```
Enter new collector power level [0 - 31]: 10

Transmit power level successfully set to 10.
```

7. Repeat steps 2 thru 6, as necessary, for beacon power level.
8. Exit laptop connection in accordance with Product Bulletin 111.

Changing Transmit Frequency of RIB

The AMU collector radios must be set to a frequency different from other AIM FMUs, and also at a frequency different from beacon radios. The frequencies of the beacon and collector radios may be changed as follows:

1. Make a laptop connection to the powered AMU in accordance with PB-111.

> *NOTE* If FMUs are in close proximity to each other, it may be necessary to check the frequencies in each FMU to ensure they are not overlapping each other. Beacon radio frequencies in another FMU should not provide interference.

2. Determine which channels are being used. Enter Procomm command “BA”. The following screen will be displayed:

```
AIM STATUS MENU

-------------------------------

Display AIM Stats

Display Current RF Channel(s)

Get FRB or RIB Version Number

Monitor AIM Communications

Display Current RIB Transmit Power Level

Display Current RIB radios

99. Advanced AIM Debug Menu

Make Selection:
```

3. Select 2. Display Current RF Channel(s) (radios 1 thru 3, below, are for Generation 1, AIM2, 900 MHz, and not applicable):

```
Current RF Channels:

------------------------

   1. Head FRB- NOT INSTALLED - Channel: invalid.

   2. Access Point DRB      - NOT INSTALLED - Channel: invalid.

   3. Remote FRB      - NOT INSTALLED - Channel: invalid.

   4. Radio Interface Board

         - RIB Collectors      - INSTALLED      - Channel: 02.

         - RIB Beacons         - INSTALLED      - Channel: 06.
```

4. Repeat steps 2 and 3 for other FMUs in close proximity which may have overlapping frequencies.
5. Knowing the frequencies in use, if a change must be made enter Procomm command “B9”:

AIM STATUS MENU

---

1. Display AIM Stats
2. Display Current RF Channel(s)
3. Get FRB or RIB Version Number
4. Monitor AIM Communications
5. Display Current RIB Transmit Power Level
6. Display Current RIB radios
99. Advanced AIM Debug Menu

Make Selection:

6. Select 99. Advanced AIM Debug Menu:

AIM ADVANCED DEBUG MENU

---

1. Reset processor on FRB or RIB
2. Unused
3. Set RF Channel
4. View/Change Status Poll Settings
5. Display Current RSSI Readings (Gen1 radios only; takes 70 seconds)
6. Monitor hose status change messages
7. Control Access Point Radios
8. Monitor programming hose tag
9. Monitor real-time AIM transactions
10. Clear FRB saved good RF channels (Gen1 radios only)
11. Set FRB and/or RIB saved good RF channels
12. Test FMU <-> RFRB communication
13. List Query Stats
14. Set RIB Transmit Power Level.
15. View saved good RF channels
99. FMU RF test mode

Make Selection:

7. Select 3. Set RF Channel:

```
Select which AIM radio board:
------------------------
1. Radio Interface Board
Selection:
```

8. Select 1. Radio Interface Board:

```
Select which RIB radio type:
------------------------
1. RIB collector
2. RIB beacon
Selection:
```

NOTE RIB collector channel choices are 1-15, excepting 0, 6, and 12. RIB beacon channel choices are 0, 6, and 12. If bidirectional beacon radios are being used, select different channels for each radio.

9. Select 1. RIB collector (or 2. RIB beacon):

```
RIB collector Channels = [1-15] except (0, 6 or 12)
Choose new channel:
```

10. Enter the desired channel choice:

```
Choose new channel: 10
Channel successfully set to 10
```

11. Repeat steps 5 thru 9, as necessary, for 2. RIB beacon using only channels 0, 6, or 12.
12. Exit laptop connection in accordance with Product Bulletin 111.

TIP If any questions arise, contact Syntech Systems, Inc.'s Customer Satisfaction Center (CSC) at 1-800-888-9136, ext. 2, or email support@myfuelmaster.com.

Change Log

Date	Description
6/16/2015	Original
6/24/2015	Revised Page 10, added: Vehicles having AIM modules with external antennas will be recognized by collector antennas from a farther distance. You can assume these vehicles may respond differently to beacon antennas. If you have a mix of vehicles with both internal and external antennas, it is recommended the following tests be performed with vehicles with both internal and external AIM antennas. Page 11, added procedure for Adjusting Transmit Power Level (TPL) Page 13, added procedure for Changing Transmit Frequency of RIB
7/17/2015	Revised Page 1, changed required FMU firmware to 3.85c, or 3.86b or later
4/28/2016	Revised Page 1, changed first bullet under **Important** to add a 2.4 AMU may be configured keyless to also accept Keypad, or Proximity Card, or Vehicle Prokee/Smartcard access (it will not accept User Prokee/Smartcard.
12/7/2020	Reformatted/rebranded