ROSEMAN

A LEGACY OF INNOVATION

FJ3 Installation Manual

FuelFocus™ FMS System

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Important Notice

Roseman cannot guarantee the RF Vehicle ID Box installation techniques discussed herein are complete and effective on every make, model and year of vehicle and equipment now in the marketplace, or in the future.

At times vehicle manufacturers make changes to the engine computer (ECU/ECM), wiring and/or electronics, with new model years and during mid-year production. After-market accessories may also impact the installation of the FJ3 RF Vehicle ID Box.

Roseman provides updates as soon possible after discovering installation challenges, new OBD CAN types or anything effecting proper operation. We request feedback from many knowledgeable Automotive Technicians working with this technology.

If installation issues arise with new model years or unique equipment, we request detailed feedback so corrections and enhancement may be made in a timely fashion. By working together, we can assure that the FuelFocus system remains the finest available.

Revisions Follow-up

Rev.	ECO No.	Description	Date	Approved
A00		Release	14/08/2022	Haim Kashi

1 Introduction

1.1 Purpose

This FuelFocus® Vehicle Subsystem Installation Manual instructs how to install the Modular Fleet Journal Type 3 (FJ3). Review this manual prior to installing the FJ3. Incorrect installations may cause the system to malfunction.

Read this entire manual before your first installation.

1.2 System Overview

The Roseman FJ3 is the main component of the Roseman FuelFocus® FMS System in the vehicle. The following are required to properly install and utilize the FuelFocus® FJ3:

- Roseman FuelFocus® Fuel Management System Island Controllers (ICU)
- Pumps/dispensers equipped with FuelFocus FJ3/dual mode nozzle tags
- FJ3 WAF Receiver Kit installed on the FuelFocus Island Controller (ICU)

Shielded cable is required, as described in the manual. Failure to use one will void the warranty.

1.3 Components Overview

This section describes the various components in the Roseman FuelFocus® System, to determine the equipment needed for your specific fleet of vehicles.

Each Vehicle Unit includes the following components:

- Fuel Inlet Antenna (FIA)
- Hardwired FIA Adapter (if a SVID is not used)
- SVID (Small Vehicle Identification Device) Type 3 (If applicable)
- Modular Fleet Journal Type 3 (FJ3)

1.3.1 Modular Fleet Journal (FJ3)

The FJ3 is the main component of the Fleet Journal system installed in the vehicle. It stores the vehicle usage data, which includes the start and end times of a trip, beginning and ending odometer readings, maximum speed and more. This provides the fleet manager data of the use of all fleet vehicles.

The FJ3 data automatically transfers the data to the FMS application via the ICU/WAF when within approx. 300 feet of the antenna (line of sight).

The FJ3 can be configured to record odometer and/or engine hour readings

The Vehicle data is uploaded in one of the following methods:

- 2.4GHz Wireless connection with fuel station controller (ICU).
- 2.4GHz Wireless VDC connection at parking lot, garage, etc.
- Online connection via cellular modem.

This document describes the installation procedures for the FJ3 (2.4 GHz).

Description	Part No.
Modular Fleet Journal Type 3	RID-FG3-XX-AW

Power Consumption

The FJ3 receives its power from the vehicle's battery, 12 Volt or 24 Volt systems. The power draws are:

Measure values	Average @ 12V	
Engine ON	43mA	54mA with hardwire FIA
Sleep	10mA	14mA with hardwire FIA

Note If you experience battery drain, we recommend the use of an automotive "shut-down" timer relay or similar, available from the automotive aftermarket. This is commonly used on police/emergency and utility vehicles to prevent dead batteries due to drain from aftermarket installed electronics.

1.4 Required Tools

The following tools are recommended to complete the installation procedures:

- Screwdrivers
- Solder equipment (if not crimping)
- Crimping tool
- Wire stripping tool
- Drill with 1/8" drill bit
- Heat gun (for heat-shrink insulation)

1.5 Required Materials

The following materials are required to complete the installation procedures:

- Two conductor twisted pair cable 18 - 20 AWG with foil shield and drain wire
- Wire terminals. Do not use Scotch Locks.
- 3/8" inch self-tapping, sheet metal screws (Rittal SZ2487 or equivalent) with matching flat washers and split washers
- Grommets
- 3 Amp fuse and fuse holder
- Wire ties, wire solder and wire loom
- Heat shrinks tubing
- Red/Pink Butt connectors for 18-20 AWG wire

1.6 Wiring Instructions

The general procedures for wiring the FJ3 are as follows:

- Using a wire stripping tool, remove insulation to expose 3/8" of wire.
- Press firmly on the FJ3's orange connector locking tab.
- Insert the exposed wire end.
- Release the locking tab.
- Check to make certain the wire is held firmly in place and that the wire insulation is not pinched in the terminal.

Use gasoline and oil-resistant wiring only. Route wires away from moving parts and the vehicle's exhaust system.

2 Installation

Follow the installation instructions detailed in the following sections.

Note	When performing wiring procedures, follow the instructions in *Wiring Instructions* on page 7.

2.1 Installation Considerations

Before mounting the FJ3 and SVID, determine the best place to install. Consider the following four basic recommendations:

- **Weather/water Protection** – Select a weather-protected location. ***The FJ3 is not waterproof.*** Consider an area where it will not be exposed to water/moisture, during vehicle operation or cleaning.

- **Cable Runs** – The Fuel Inlet Antenna (FIA) is mounted in a Class I, Division I hazardous location. The wiring is intrinsically safe, and therefore must not come within two inches of any existing wires or cable harness. Installing the FJ3 to minimize the FIA cable length makes it easier to adhere to this safety rule. The FJ3 also requires connections to power and ground, so it should be located in an area where you can readily access these sources easily.

- **Cable Routing** –Keep cables/wires from coming in contact with moving parts and away from parts that generate excessive heat, electrical noise, or areas that may impede safety. These areas include the drive shaft, fan blades, belts, adjustable steering column, alternators, fluorescent lighting, foot pedals, radiator, engine, exhaust system, and other dangerous areas. Try to gather all conductors at a common point, routing the cables to the FJ3 in a group. The FJ3 must be kept at least three feet from the filler neck opening. This includes cases where the FJ3 is mounted in the trunk, as that is not a vapor-sealed area. Wire loom is highly recommended to protect the wiring.

- **Cable Clearance** – Keep the FJ3 and cables at least 6 inches from devices with a strong magnetic field such as fan motors or speakers.

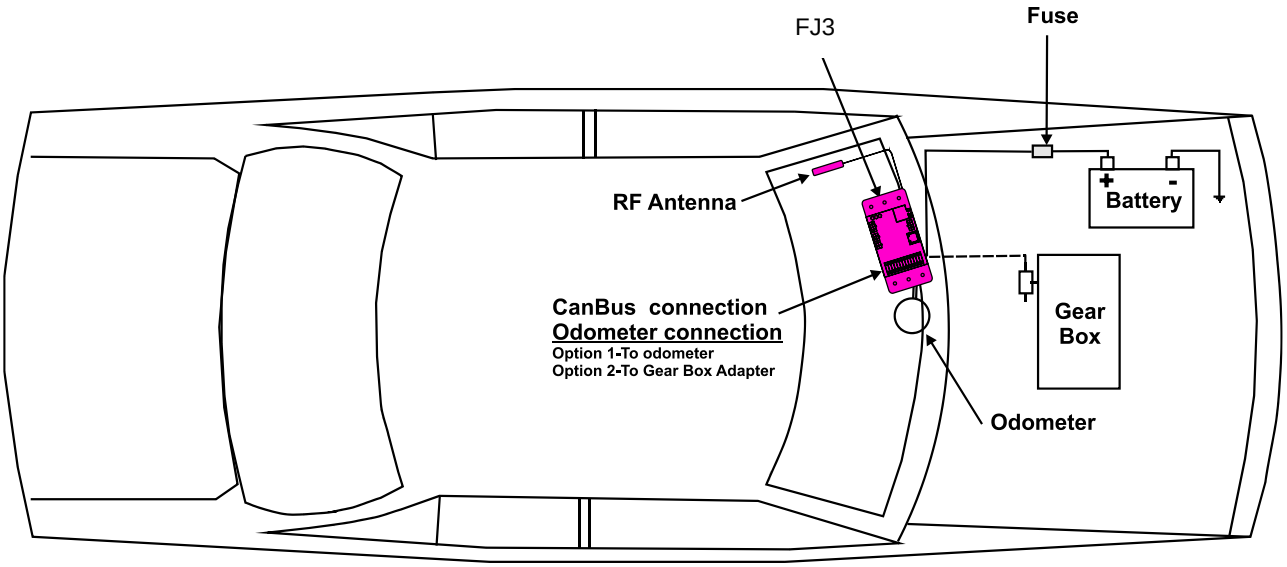


Figure 1 Typical Vehicle Wire Routing

Do not use an electric drill or any other electrically powered tools within 3 feet of the filler neck or fuel tank, as this area is considered a Class I, Group D hazardous location.

Do not use a heat gun or any other heating device within 3 feet of the filler neck or fuel tank as this area is considered a Class I, Group D hazardous location.

The Fuel Inlet Antenna and its wiring are intrinsically safe. Ensure there is complete separation between the transmitter wiring and any existing auto wiring. Also avoid routing wires near the auto exhaust systems or fuel lines.

Mount the FJ3 at least 3 feet from the filler neck.

Water and/or moisture can seep in through the connectors causing permanent damage!

3 FJ3 Installation

3.1 Mount the FJ3

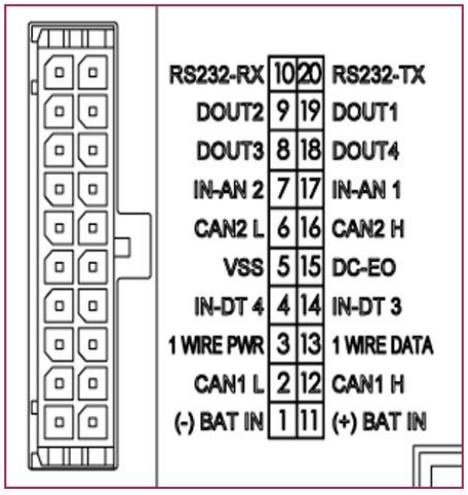
1. After reviewing the recommendations listed in 2.1 “Installation Installation Considerations”, mount the FJ3 as follows:
    - If possible, mount it on the same side of the vehicle as the filler neck.
    - For a passenger car, the FJ3 can be mounted under the dashboard or in the trunk, provided that the unit is at least 3 feet from the filler neck.
    - For a truck or bus, the FJ3 can be mounted inside the vehicle's electric enclosure.

2. Drill at least two 1/8" holes for the FJ3 mounting. Use the FJ3 to mark the holes (see **Error! Reference source not found.**)

3. Mount the FJ3 on the vehicle chassis, or any other metal portion of the vehicle whenever possible. (See figure 2)
4. Use min. two 3/8" self-tapping mounting screws and lock washers and mount the FJ3 to the vehicle chassis/frame.

Do not use an electric drill or any other electrical power tool within 3 feet of the filler neck or fuel tank. This area is considered a Class I Group D hazardous location.

3.2 FJ3 Connector 20 PIN out



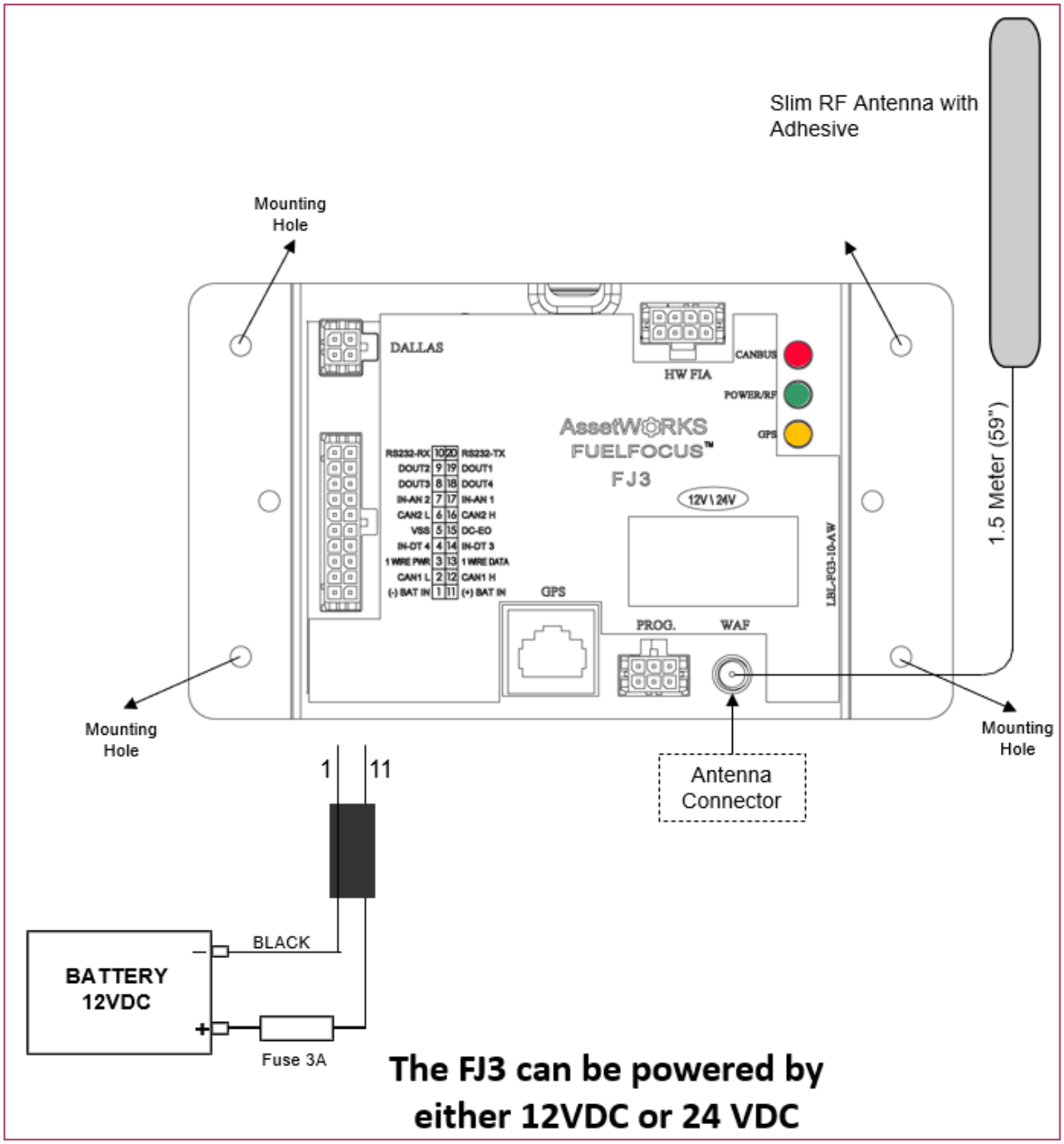


Figure 2 FJ3 Mounting and Power Diagram

3.3 Connect the RF Antenna

The RF Antenna is connected by threading the Antenna connector to the WAF RF jack on the FJ3.

3.4 Mount the RF Antenna

The RF Antenna is mounted by removing the protective layer from the adhesive tape and attaching to the vehicle windshield. The same location can be used near the rear window if desired.
Note: Clean the windshield before mounting the antenna.

In busses, the RF Antenna can be mounted in the sign compartment area, if it is made of fiberglass.

The antenna must not be concealed on all sides by metal.

Note	The RF Antenna should be fastened and secured appropriately. Do not coil the antenna wire.

3.5 Connect the FJ3 to the Battery or Power Source

Positive (+) connection can be from any 12 VDC or 24 VDC constant or timed power source. If using a timed power source, we recommend at least a 30-minute power off delay after Ignition Off.

If your power source is the battery, run an 18 – 20 AWG wire from the battery to the FJ3 and connect it to BATT (+). This wire requires a 3 Amp fuse.

3.6 Connect the FJ3 to Ground

Connect the FJ3 to a ground, the vehicle metal chassis, or to the negative (-) post on the vehicle's battery.

- When connecting to the vehicle battery:
  Prepare a black auto wire with a terminal on each end. Connect the black (-) cable from BATT (-) on the FJ3 to the negative (-) terminal on the battery.
- When connecting to the vehicle metal chassis (see note below):
  Connect a black ground cable from BATT (-) on the FJ3 to one of the FJ3's mounting screws. Loop the cable end around the screw between the screw head and the FJ3 plate and tighten the screw.

Note	This will connect the FJ3 to ground only if the FJ3 is affixed to the grounded metal chassis of the car.

4 Wiring VSS or Pulse Vehicles

4.1 Locating the VSS (Vehicle Speed Signal)

The VSS or VSO (Vehicle Speed Output) usually originates near the transmission output shaft. From there it travels to the engine control computer, speedometer and the cruise control computer. Pick a location to tap the circuit near the engine control computer interface, reducing risk of incorrect data due to ignition noise. Also, as with any electronic accessory, a good ground connection is necessary. Improper grounding could result in a ground loop condition, which may affect the accuracy of the unit.

Note	Roseman can provide you with an aftermarket catalog for VSS wire, its color, and how many pulses per mile for the vehicle.

4.2 Connect speed or hour data to the FJ3

The instructions for this procedure depend on the type of vehicle
To view how to capture vehicle data, refer to *the* ***Error! Reference source not found.***

Note:	**FJ3 will not function properly if an "Ignition On/Off" wire is not connected to the DC-EO terminal. FJ3 goes into Sleep mode (Power Save) 30 minutes after ignition off.**

4.2.1 Connect the FJ3 an Odometer

There are two possible odometer connections:

- Direct from an electronic odometer or a speedometer.
- From a mechanical odometer via a Reed type odometer adaptor. Also known as a pulse transducer or "taxi tap"

Note:	If you are recording the vehicle's engine hours, you may skip this section and go on to section **Error! Reference source not found.** REF _Ref455244593 \h **Error! Reference source not found.**.

4.2.2 Electronic Odometer or Speedometer

If the vehicle has electronic instrumentation, run a single wire from the vehicle speed sensor output VSS /VSO + signal to the FJ3 and connect it to "VSS". (See figure 3)

4.2.3 Reed Type Mechanical Adaptor

If the vehicle has a mechanical odometer, and using a Reed type adaptor, run two wires to the FJ3 and connect it to " BAT(+)" and "VSS". (See figure 3)

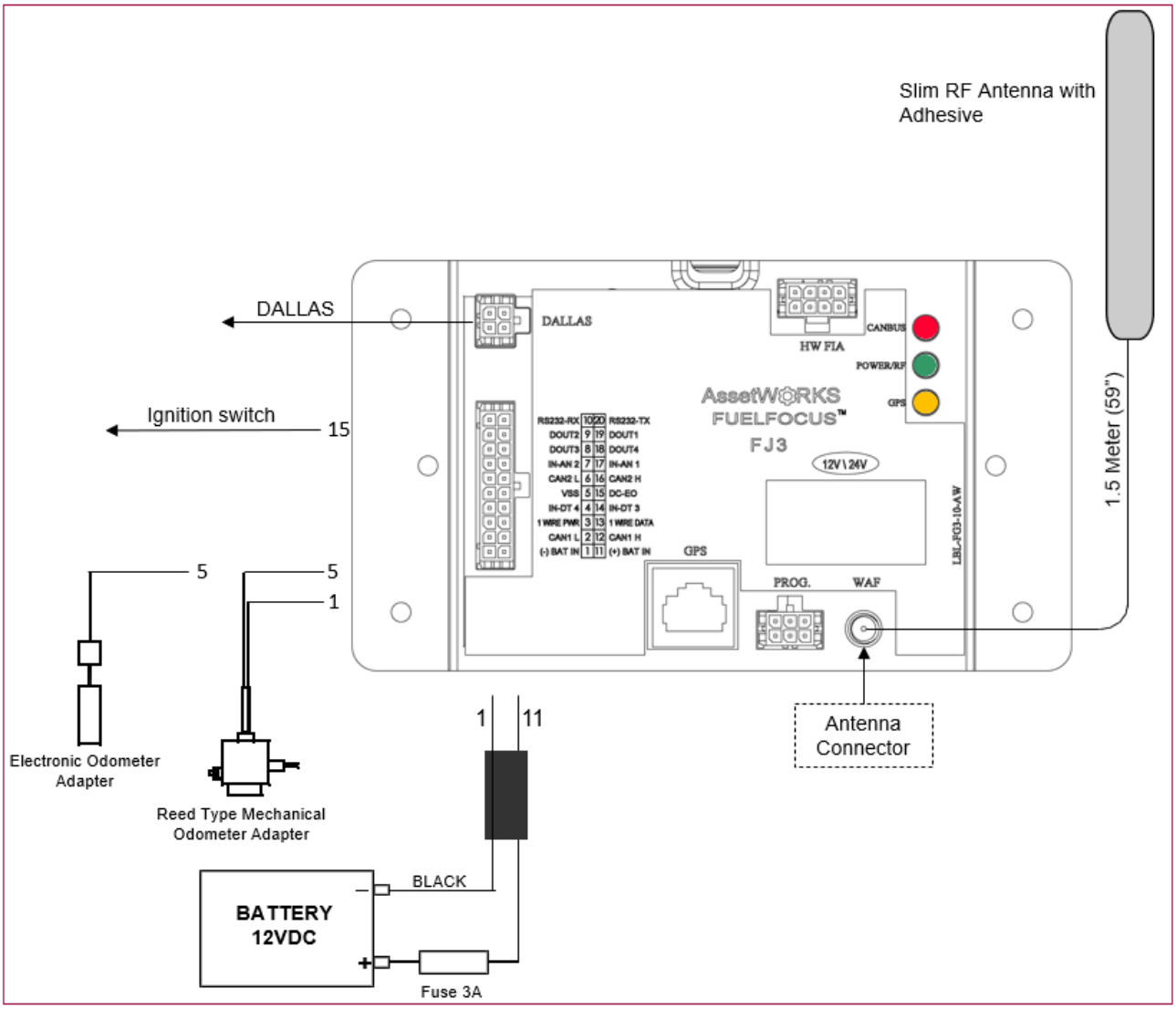


Figure 3 FJ3 Wiring Diagram for Speed Pulse

4.2.4 Engine Hours

To record engine hours, run a single wire from the oil pressure sensor (or any other sensor that is at a continuous "high" state while the engine is running), to the “VSS” input on the FJ3.

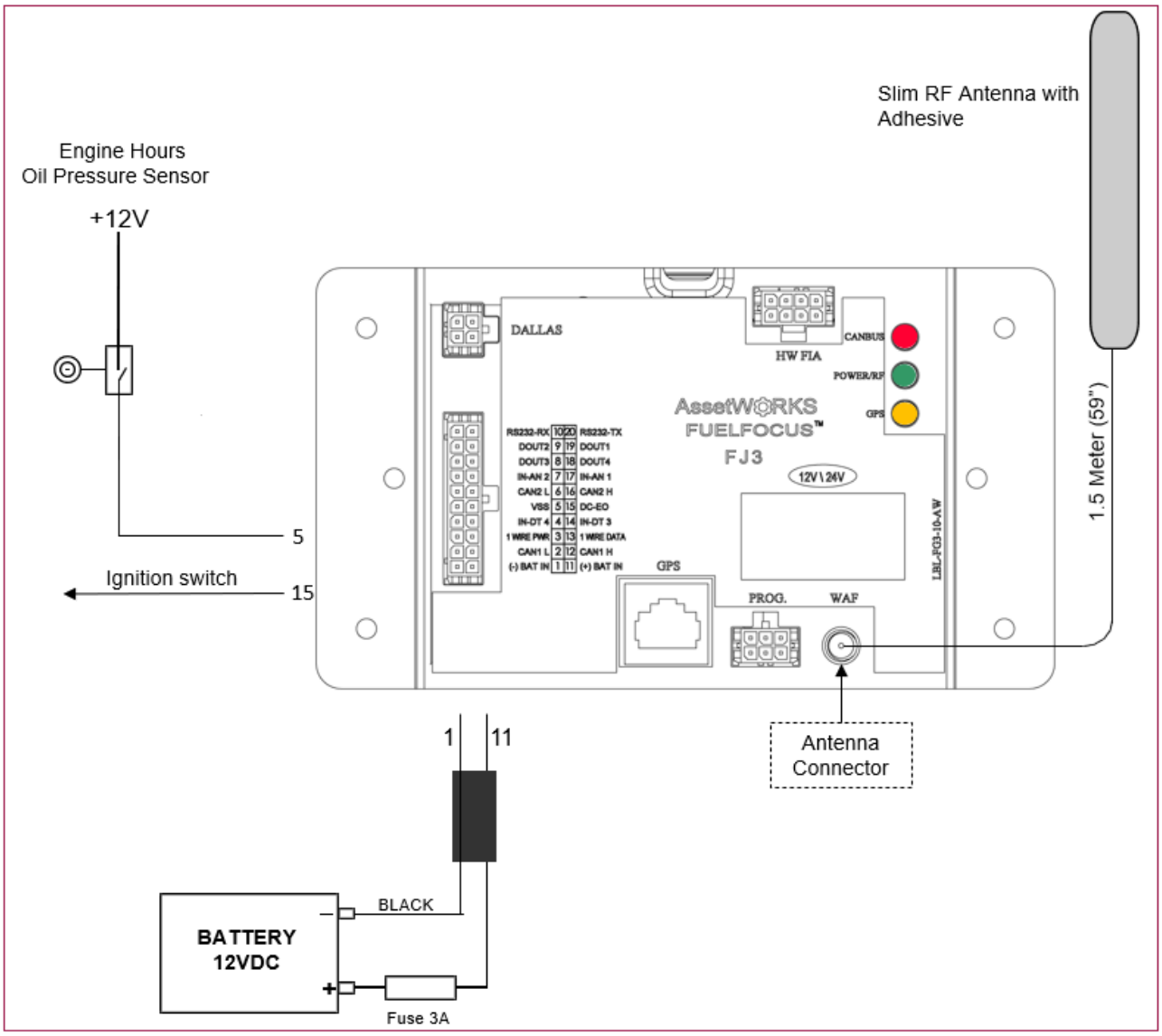


Figure 4 FJ3 Wiring Diagram for Engine Hours

5 FJ3 Wiring Diagram for Engine Hour Meter Wiring CANBUS (OBDII) Vehicles

5.1 Connect the Ignition Switch to the FJ3

1. Run a wire from the vehicle ignition switch or any “Key Hot” source (or start/stop button on some hybrid models) to **the DC-EO terminal** on the FJ3.
2. Refer to:

   Figure 5: Wiring Diagram for FJ3 with CANBUS OBDII for Light Duty Vehicles

   Figure 7: Wiring Diagram for FJ3 with J1939 9-pin Deutsch for Heavy Duty Vehicles

   Figure 8: Wiring Diagram for FJ3 with J1939 Deutsch 3-pin connector for Heavy Duty Vehicles)
3. The FJ3 needs constant 12- or 24-Volt DC power at the BAT+ and BAT- terminals

Note	**FJ3 will not function properly if an “Ignition On/Off” wire is not connected to the DC-EO terminal. FJ3 goes into Sleep mode (Power Save) 30 minutes after turning off the ignition.**

5.2 Connect the CANBUS Data wires to the FJ3

The instructions for this procedure depend on the type of vehicle, whether it is a heavy-duty or a light duty vehicle. Light duty vehicles have an OBD II connector, while heavy duty vehicles have a SAE J1939 connector. The following sections provide instructions for both types of vehicles.

To view the connector’s, pin out information, refer to:

Appendix A – Capturing Vehicle Data on pages 41, 42 and 43

Part numbers for AW wire harnesses:

OBDII: CUS-MMU003 (includes J1939 wires for Volvo and Mack trucks)

J1939 9-pin Deutsch (Black): CUS-MMU0092

J1939 9-pin Deutsch (Green): CUS-MMU0092G

J1939 3-pin Deutsch: B-5935 (mostly used for transit buses)

5.2.1 Connect the FJ3 to an OBD II Connector (Light Duty Vehicle)

If the vehicle has an OBD II connector, perform the following (if not using the AW OBDII harness):

4. Run a twin wire cable from the vehicle connector to the FJ3.
5. Connect the FJ3 CAN_H pin 12 to pin 6 of the OBD II connector.
6. Connect the FJ3 CAN_L pin 2 to pin 14 of the OBD II connector.

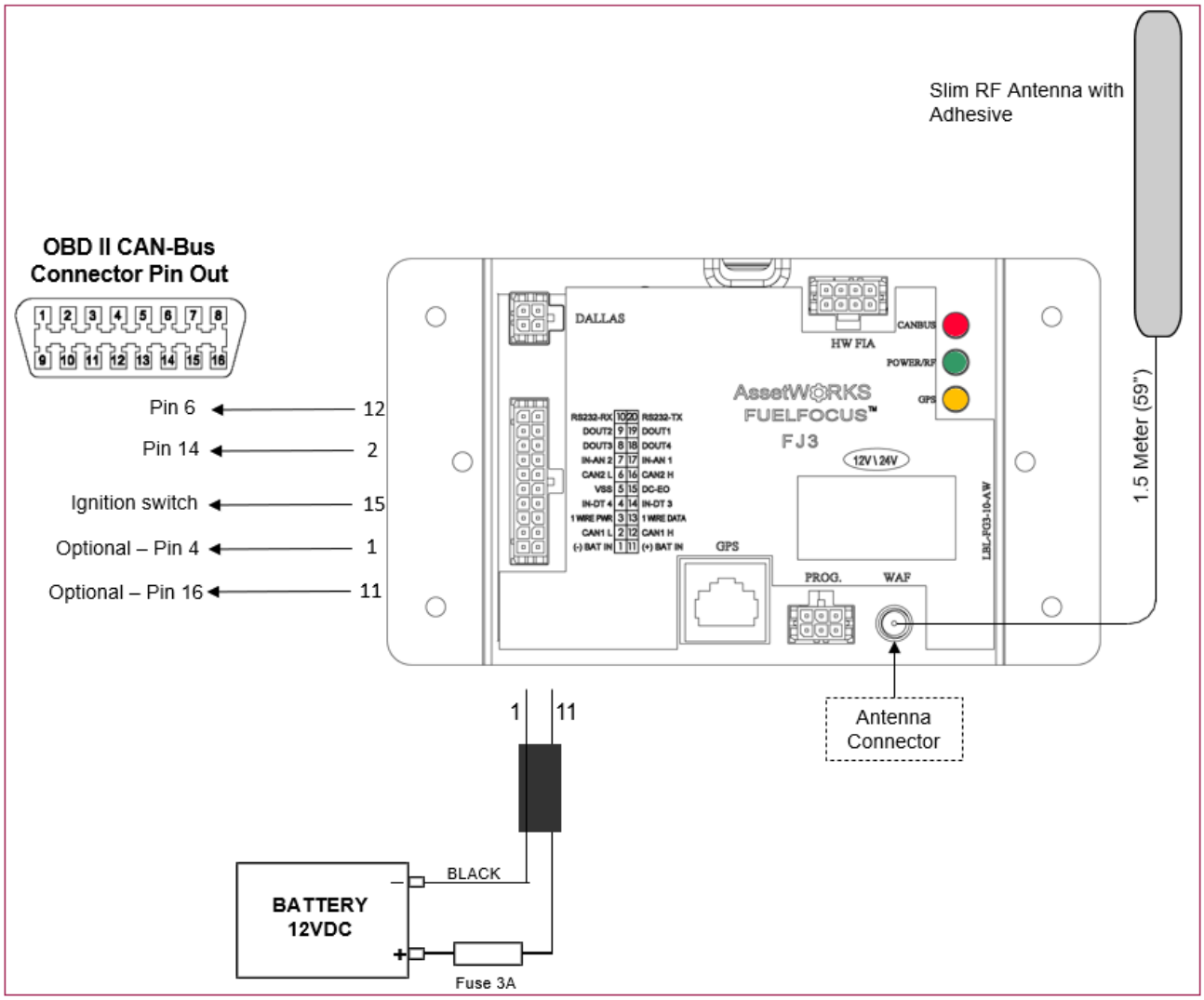


Figure 5: Wiring Diagram for FJ3 with CANBUS OBDII for Light Duty Vehicles

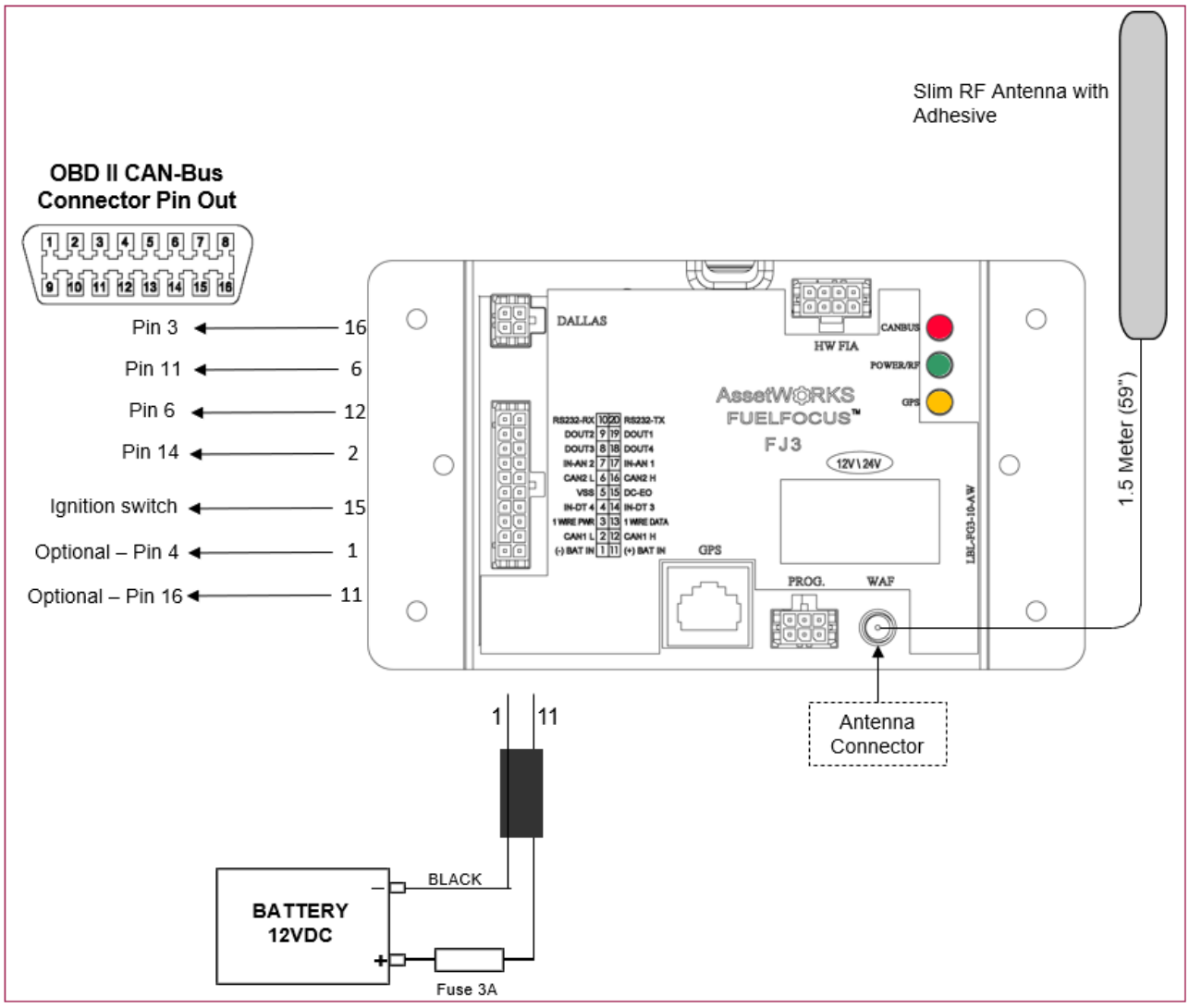


Figure 6 :Wiring Diagram for FJ3 with CANBUS OBDII With 2 CAN BUS for Light Duty Vehicles

5.2.2 Connect the FJ3 to a 9-pin J1939 Connector (Heavy Duty Vehicle)

If the vehicle has a 9-pin Deutsch plug, perform the following (if not using the AW J1939 harness):

1. Run a twin-wire cable from the vehicle connector to the FJ3.
2. Connect the CAN_H Black wire pin 3/C of the Deutsch connector to the FJ3 point CAN_H pin 12.
3. Connect the CAN_L White wire pin 4/D of the Deutsch connector to the FJ3 point CAN_L pin 2.

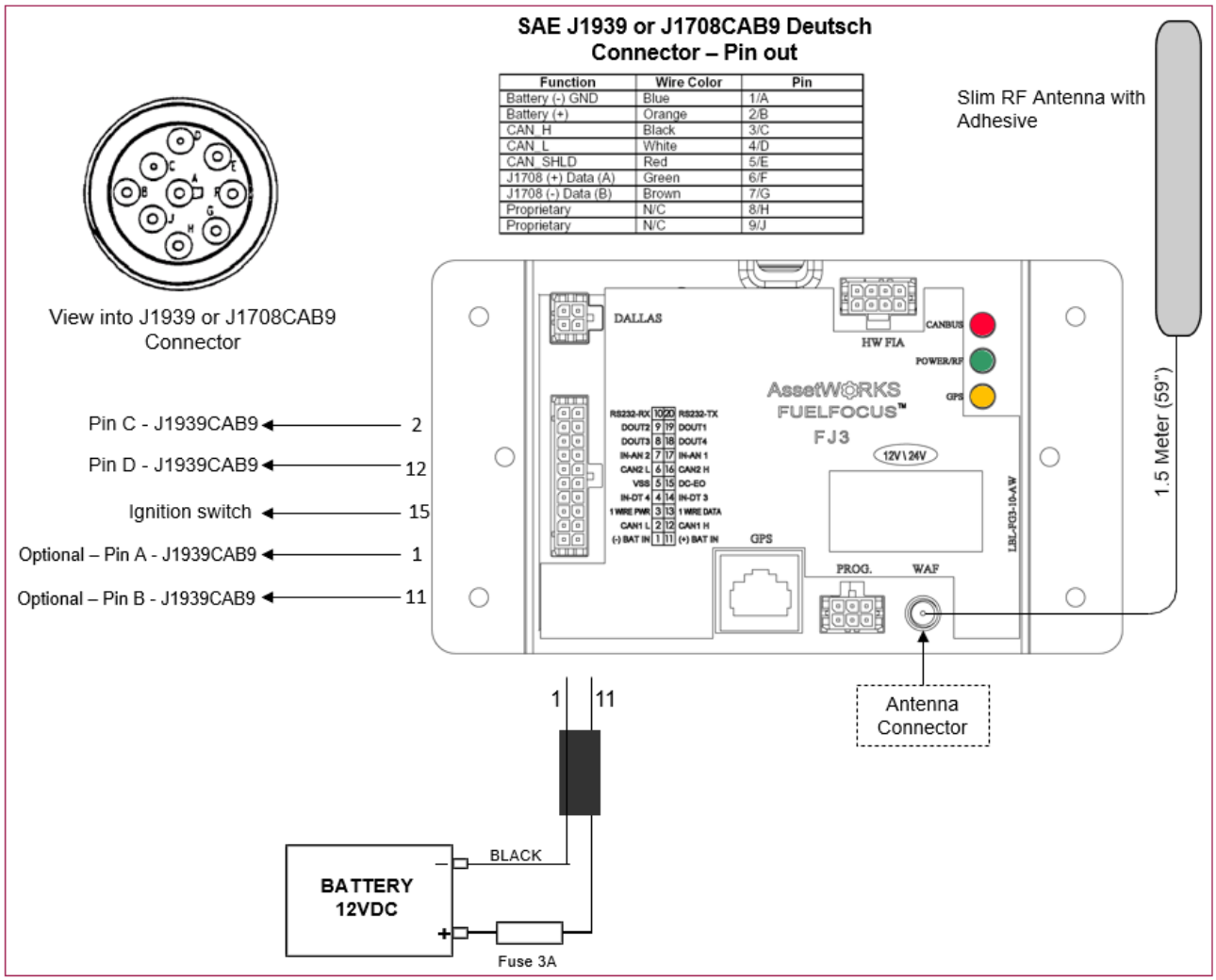


Figure 7: Wiring Diagram for FJ3 with J1939 9-pin Deutsch for Heavy Duty Vehicles

5.2.3 Connect the FJ3 to a 3 pin J1939 Connector (Heavy Duty Vehicle)

If the vehicle has a 3-pin Deutsch connector, perform the following (if not using the AW 3-pin harness):

1. Run a twin-wire cable from the vehicle connector to the FJ3.
2. Connect the CAN_H pin B of the Deutsch connector to the FJ3 point CAN_H pin 12.
3. Connect the CAN_L pin A of the Deutsch connector to the FJ3 point CAN_L pin 2.
4. Connect the ground pin C of the Deutsch connector to the FJ3 point BATT (-) pin 1.

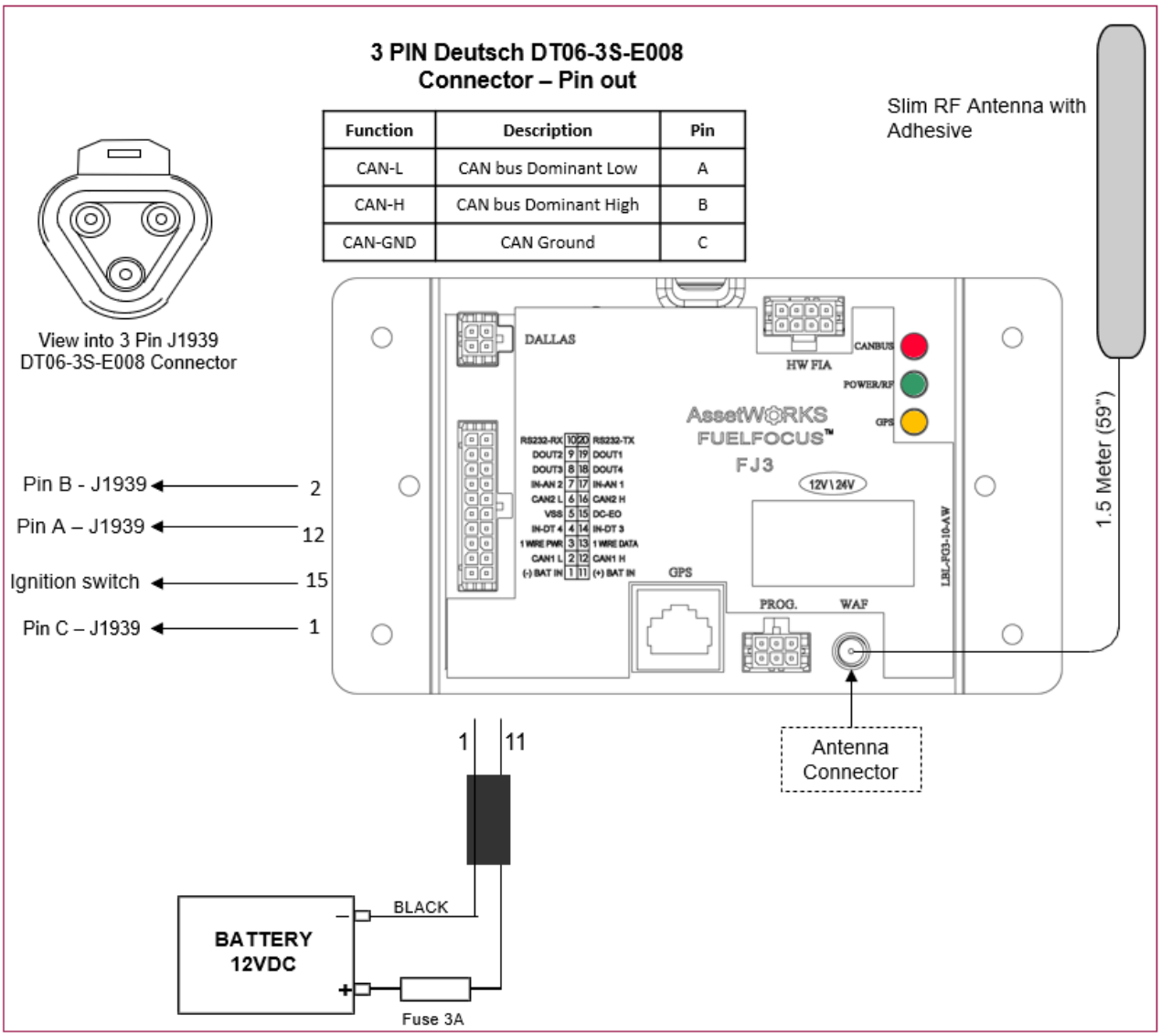


Figure 8: Wiring Diagram for FJ3 with J1939 Deutsch 3-pin connector for Heavy Duty Vehicles

6 Wiring J1708 Vehicles

6.1 Connect the Ignition Switch to the FJ3

Run a wire from the vehicle ignition switch or “key-hot” source to the DC-EO terminal on the FJ3 (see

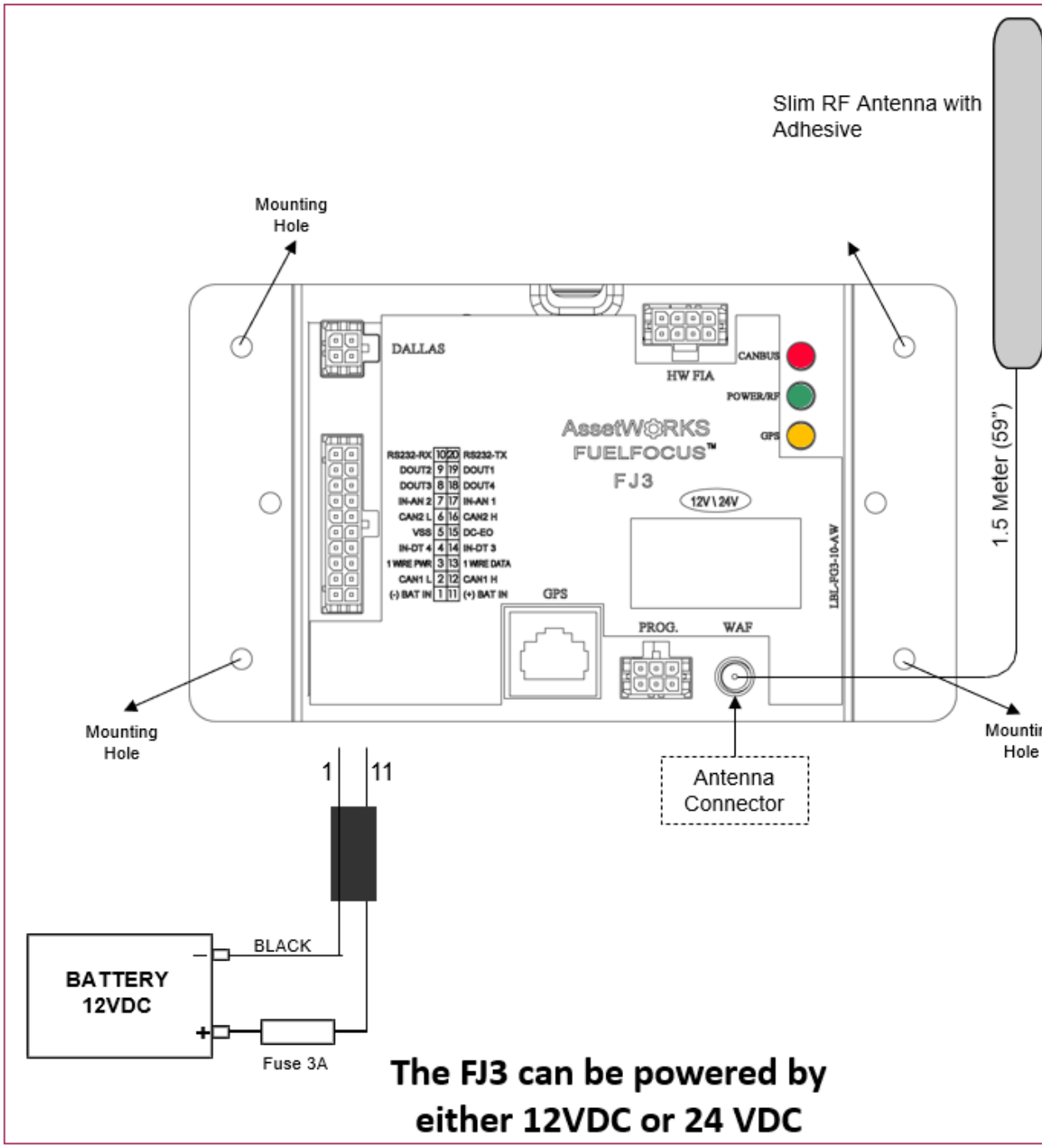


Figure 2 FJ3 Mounting and Power Diagram

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Note	**FJ3 does not function properly if an ignition On/Off wire is not connected. FJ3 goes into Sleep mode 30 min after turning off the ignition.**

6.2 Connect J1708 Data wires to the FJ3

The instructions for this procedure depend on the type of the connector equipped with the vehicle – whether it is a J1708 CAB9 (9 pin) connector or a J1708 CAB (6 pin) connector.

The following sections provide instructions for both types of vehicles.

To view the connectors' pin-out information, refer to *the* ***Error! Reference source not found.***

Note	**Optional Power Supply Connection J1708 6-pin connector** The power supply can be connected to FJ3 from the J1708 CAB 6-pin connector, if pin C provides 12 – 24 volts with the ignition in the off position: - Connect Pin C to BATT (+) on the FJ3. - Connect Pin E to BATT (-) on the FJ3. **Roseman do not sell or provide a J1708 6-pin harness**

Note	**Optional Power Supply Connection J1708 9-pin connector** It is possible to supply the power to the FJ3 from the J1708CAB9 if pin 2/B has 12-24 volts with the ignition in the off position: - Connect Pin 2/B to BATT (+) on the FJ3. - Connect Pin 1/A to BATT (-) on the FJ3. **Roseman 9-pin J1939 harness includes J1708 wires.**

6.2.1 Connect the FJ3 to the J1708 9-pin CAB9 Connector

If the vehicle has a 9 pin Deutsch connector perform the following, (if not using the AW 9-pin cable):

1. Run a twin wire cable from the vehicle connector to the FJ3.
2. Connect the J1708 Data link (+) wire from pin F of the Deutsch connector.
3. Connect the J1708 Data link (-) wire from pin G of the Deutsch connector.

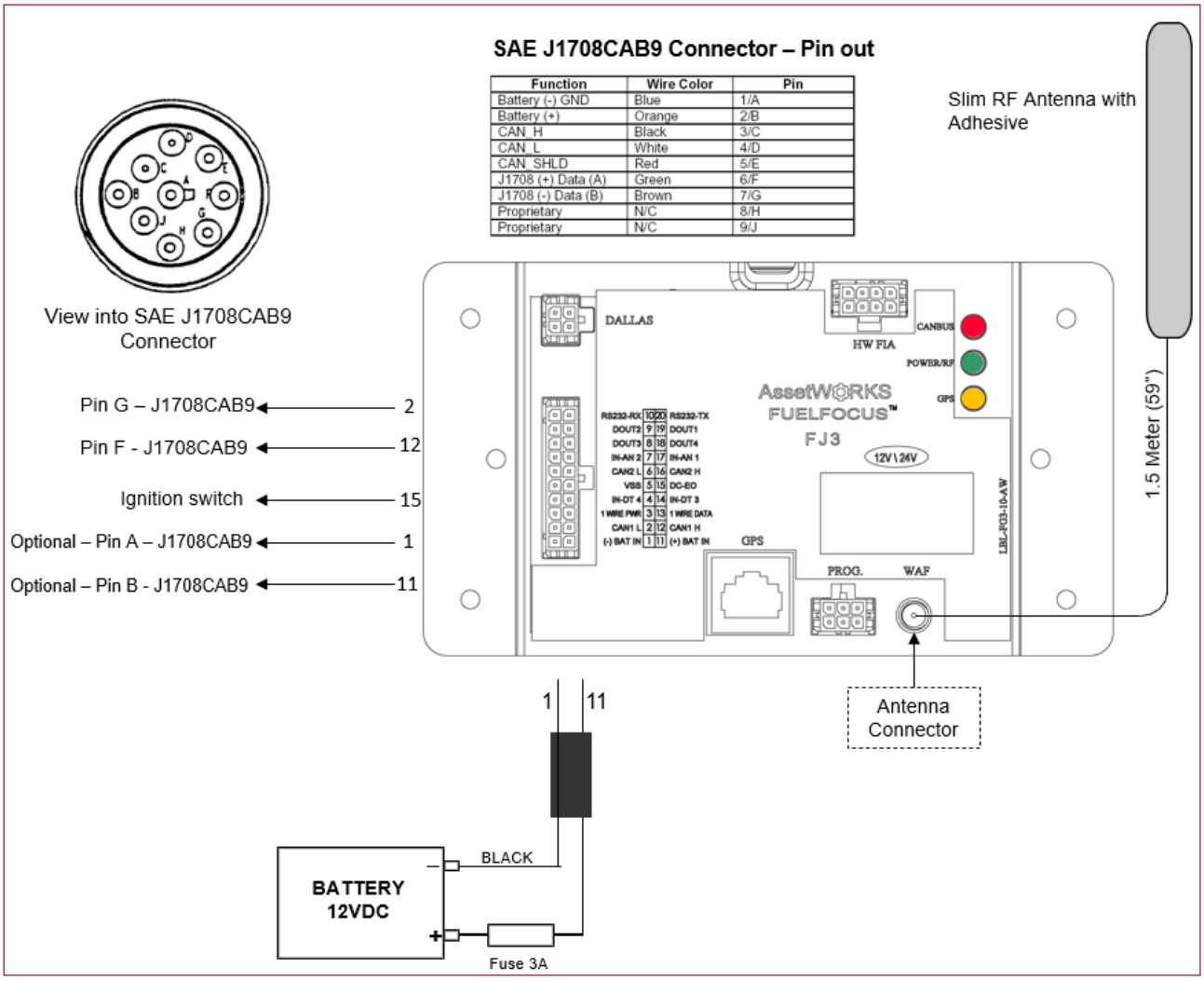


Figure 9: Wiring Diagram for FJ3 to J1708CAB9 (9 pin) connector

6.2.2 Connect the FJ3 to the J1708 CAB Connector

If the vehicle has a 6-pin Deutsch connector, perform the following:

1. Run a twin-wire cable from the vehicle connector to the FJ3.
2. Connect the J1708 Data link (+) wire from pin A of the Deutsch connector.
3. Connect the J1708 Data link (-) wire from pin B of the Deutsch connector.

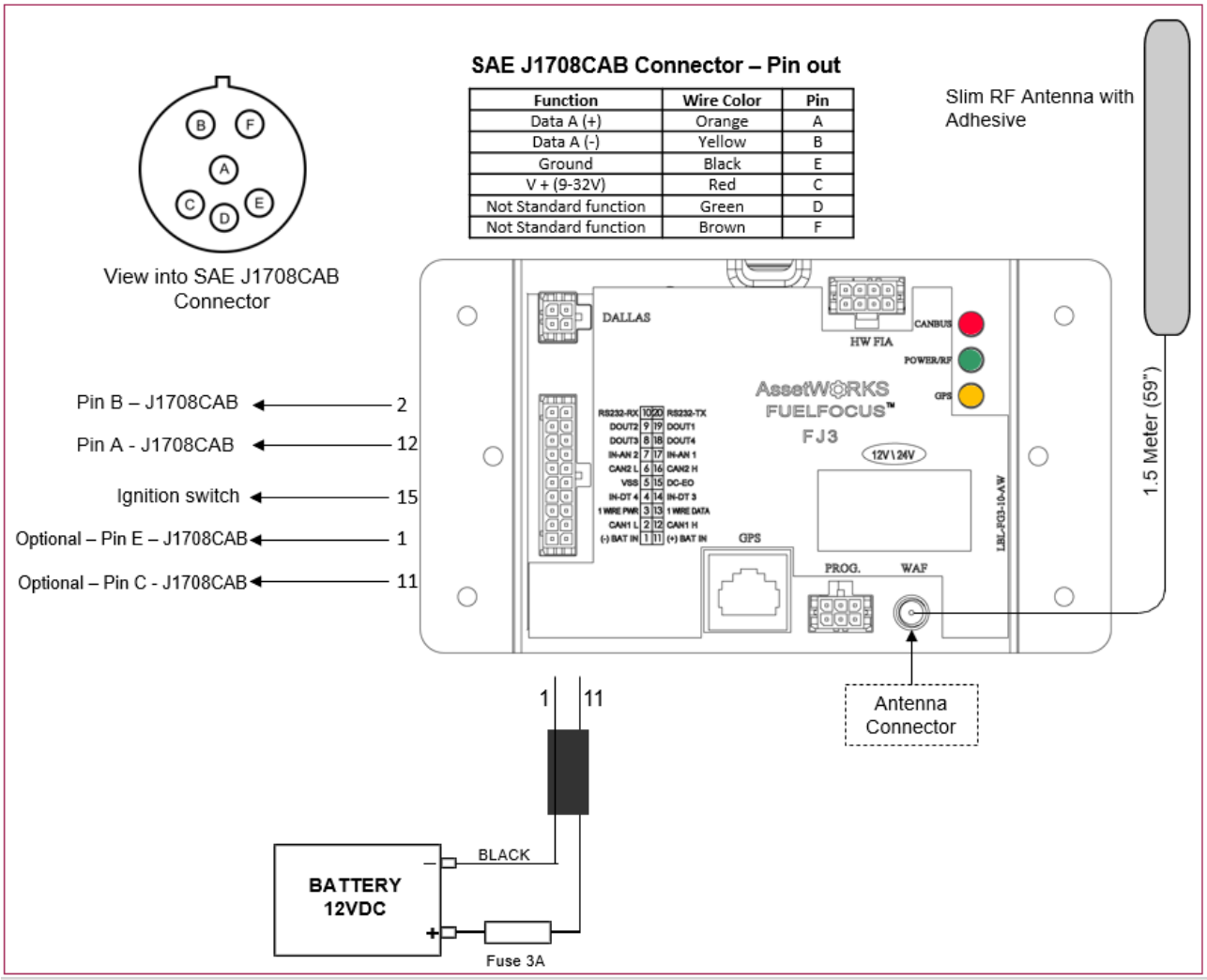


Figure 10: Wiring Diagram for FJ3 to J1708CAB (6 pin) connector

7 Completion of Installation

7.1 Verify Installation

Upon completing installation, verify that the GREEN LED on the FJ3 is blinking every second. This indicates good power and grounding.

There are three indicator LEDs on the FJ3 (see **Error! Reference source not found.**) one green LED, one red LED and one orange LED:

LED COLOR	FUNCTION	INDICATION
RED	**No Canbus or J1939 data** **Canbus Data**	• LED OFF* (see note) • LED blinking slow
GREEN	**Power and RF**	• RF transmission - Fast blinking • Power ON - Blinks every second
ORANGE	**GPS / GPRS**	Blinks when GPS unit is connected and data from the GPS is received

Note

After power up, the green LED blinks every second. (Indicating that power and ground are connected).

The green LED also blinks every time an RF message is received. (Indicating the FJ3 is communicating with the WAF or VDC antenna)

When a FJ3 is set to Hour counter using the VSS input, the red LED is on. (This indicates good communication with vehicle/equipment.)

*The DC-EO input should be checked with a Voltmeter to make sure that it is at 0 Volt DC when Ignition is Off. It should be 12 or 24 VDC with Ignition On.

8 Fueling Options

- Hardwired FIA Adaptor - P/N: RID-EM-02
- SVID - P/N: RID-IN-54

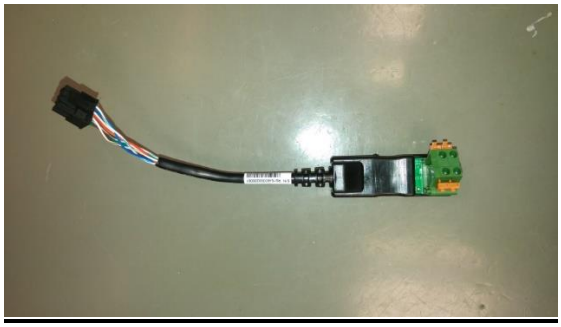
Both options require a FIA Fuel Intel Antenna ([P/N RVC-XX –XX]

8.1 Hardwired Fuel Inlet Antenna Wire Adaptor

HW FIA Wire Adaptor – part nr: RID-EM-02

Installation Instructions:

FCC Compliance and Safety	FCC ID: 2AKAM2288 This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



FIA Wire Adaptor: Rid-EM-02

Connects to the HW FIA input on the FJ3

To install the Hardwired FIA:

1. Select a fuel inlet antenna diameter to fit the vehicle's fuel tank inlet.
2. Install it using p-clamps, mountable wire ties, silicone adhesive, etc.
3. Make sure the fuel inlet antenna cable is long enough to reach the location where the FJ3 will be installed.

Note	If necessary, the cable may be extended. Use shielded cable type Olympic part # 2886 or equivalent, polypropylene insulated, twisted pair, aluminum Mylar shield, 18 – 20 AWG stranded tinned copper drain wire, chrome vinyl jacket. Temperature rating: -20ºC to 60ºC.

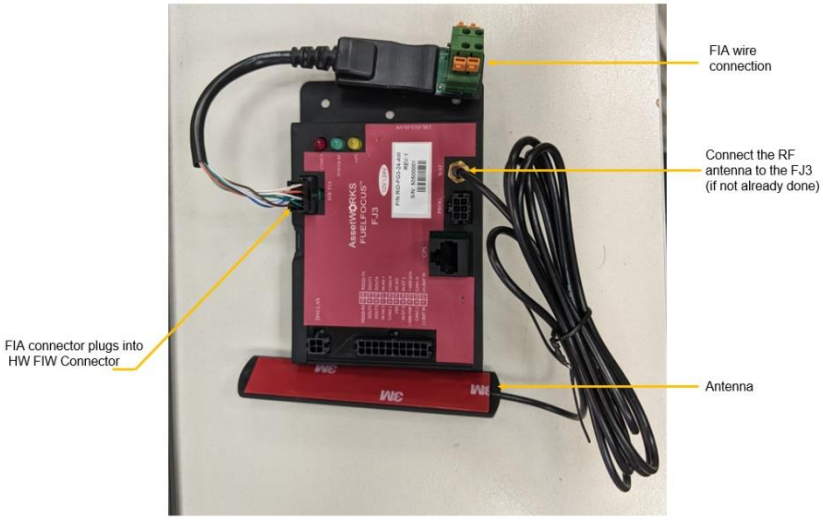
4. Solder and/or use heat shrinkable butt connectors. To prevent connection problems in the future, consider using heat shrink tubing, electric tape and split loom.

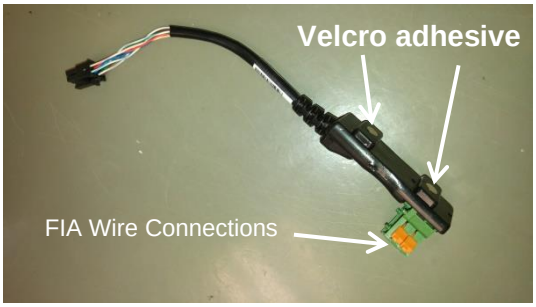
5. Install the FleetJournal 3. See Chapter 3: FJ3 Installation.

6. Connect the HW FIA plug to the FJ3 HW FIA input.

7. Install the hardwired FIA on the FJ3 edge, utilizing the Velcro adhesive as shown.

8. Plug the fuel inlet antenna wires into the green connection points next to each other. (side-by-side)





Make sure the wires are plugged in side-by-side into the connector. Press down on the orange tabs to insert or release the wires.

8.1.1 Troubleshooting

If the Hardwired FIA wire adapter does not work, do the following:

1. Use the Programmer to try read/verify the FJ3
2. If you cannot read/verify it, ensure that the FIA ring is good and correctly connected.
3. If possible, check the FIA with an Ohm meter, it should read around 50 Ohm, if not replace the FIA.
4. If still not working, replace the HW FIA wire adapter.

Note	The Fuel Inlet Antenna Connector is a sealed unit and cannot be repaired in the field. Please return the defective unit to Roseman, if under warranty.

9 Connecting the [Optional] passive GPS Tracking Device to the FJ3

- When the passive GPS device is connected to the FJ3, it tracks the location of vehicles from “Key On” to “Key Off”.
- Each “Key On to Key Off” is a “drive” that is saved in the FJ3 until it can be uploaded to the FJ3 WAF or VDC antenna once within 300’ of it. (Line of sight).
- The FJ3 can store hundreds of “drives” internally until uploaded.

Figure 11 GPS Antenna Cable

To install the GPS tracking device:

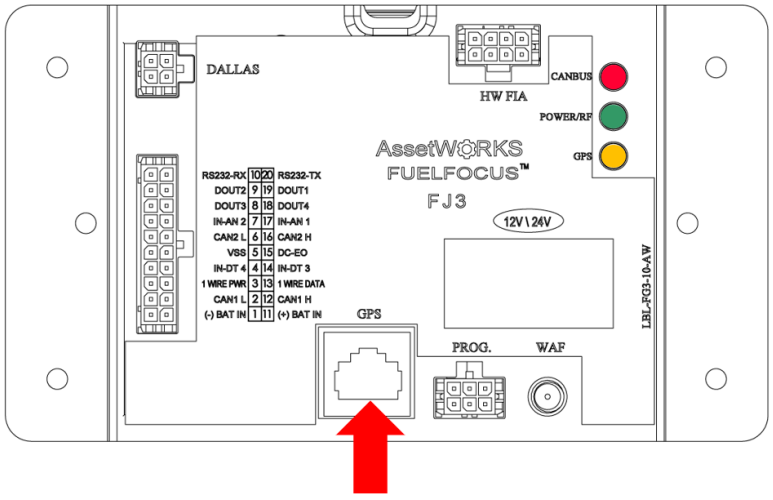


Figure 12 FJ3 GPS Location

1. Attach the RJ45 cable to the to the GPS connector on the FJ3.
2. Place the GPS antenna on the vehicle’s dashboard near the windshield.

10 Driver ID [Optional]

10.1 Connecting the Driver ID

To identify the driver of the vehicle, connect the Tag Reader with cable to the Driver ID and to the Dallas connector in FJ3.

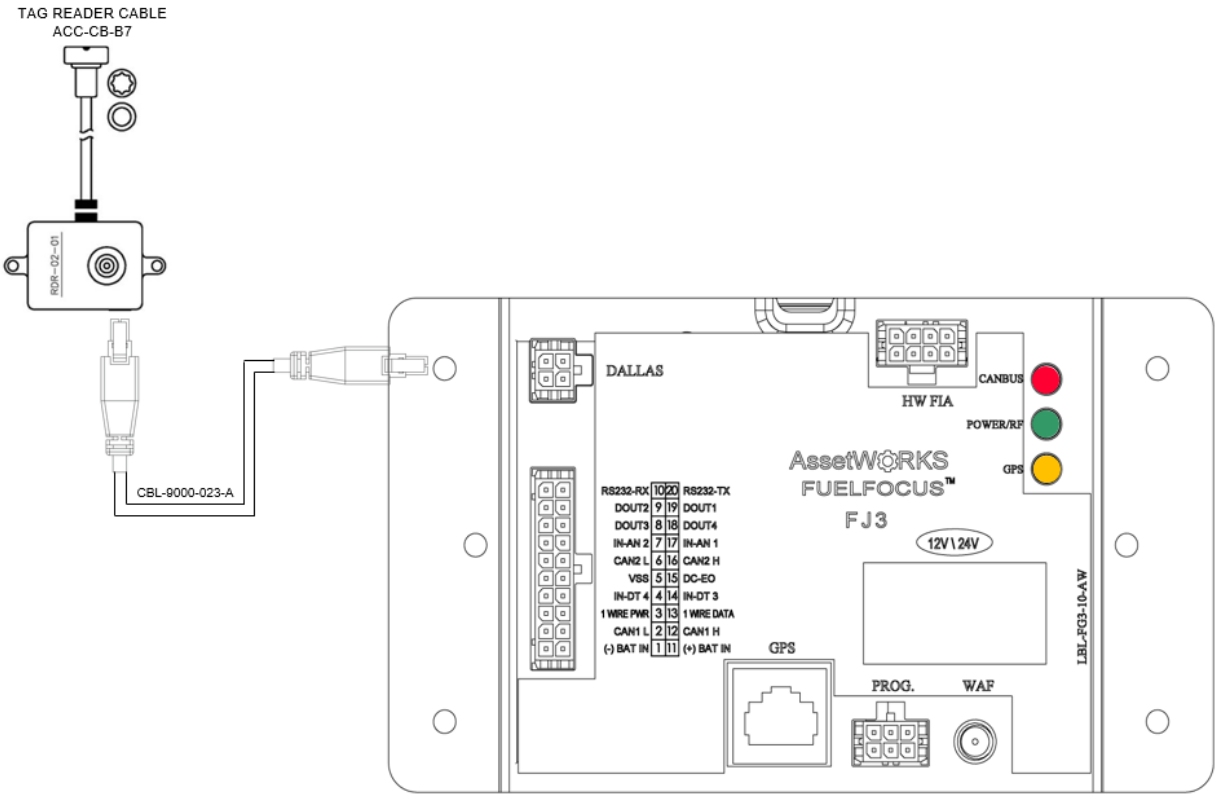


Figure 13: Connecting the Driver ID reader to the FJ3

10.2 Installing the Driver ID Reader [Tag Reader]

Note: Place the Tag reader on the dashboard so that the Dallas key can be easily read.

1. Wire the Tag Reader cables to the FJ3 – see section **Error! Reference source not found.** REF _Ref462743756 \h * MERGEFORMAT **Error! Reference source not found.**.
2. Make a ½" hole on the dashboard for the Tag Reader.
3. Pull the Tag Reader through the hole.
4. Connect the CBL-9000-023-A cable to the FJ3.

Figure 14 COM Cable CBL-9000-023-A

5. Connect the Reader Cable ACC-CB-B7 to the Driver ID Reader.

Figure 15 Reader Cable ACC-CB-B7

Important: The Driver ID Reader should be **bright red** after connecting and installing it correctly. If there is a faint green light in the center of the Reader, this indicates that the Reader is not correctly installed. All the connectors should slide in smoothly, do **not** force them.

11 Appendices

11.1 Appendix A: Capturing Vehicle Data

11.1.1 Capturing Odometer and Engine Hours Information

If the FJ3 is to record the vehicle's odometer, you will need to obtain a pulse relevant to the vehicle's speed. You can accomplish this either by utilizing an Odometer Adaptor or by receiving electronic pulses from the vehicle speed sensor (VSS) output. If your vehicle has a cable driven speedometer, a transducer is needed to convert the mechanical turns of the speedometer cable into electronic pulses that the FJ3 can read. Transducers may be ordered through a local speedometer repair shop, through the vehicle manufacturer's parts distributor, or directly from the sensor manufacturer.

11.1.2 Vehicle Data Collection (VDC) - Option

The Roseman VDC enables online wireless capture of odometer and/or engine hour readings from vehicles equipped with the Roseman Vehicle Identification Fleet Gate (FJ3). This data capture occurs when a vehicle passes within range of the Wireless Automated Fueling (WAF) Receiver installed in a parking area or at a fuel island. The vehicle data is transmitted to a local PC, which has the Roseman proprietary VSU application, and will transmit it to the FleetFocus™ application server via TCP/IP protocol.

11.1.3 Vehicle Speed Sensor (VSS)

For FJ3 pulse counting to function properly, it requires an accurate speed signal from the vehicle. This section provides a quick overview of what a speed signal is, and how to identify a speed signal.

With the introduction of the electronic control module (ECM/ECU) found in all modern vehicles, engineers use sensors to report operational data to this computer for processing.

In most cases, the vehicle's speed signal is generated at the transmission output shaft. The shaft turns at a speed directly proportional to the vehicle speed. Two different sensor types are commonly found at this location. The most common type is called a variable reluctance sensor. This is a fancy name for a series of magnets mounted to a shaft, which spins past an inductor or coil. A voltage or pulse is induced in the circuit as the magnets' lines of force cut through the inductor. The result is a signal that pulsates or oscillates at a speed directly proportional to vehicle speed. The more modern but less common type of sensor is the Hall Effect sensor, which works like the variable reluctance sensor, uses a tiny solid-state switch that is activated by a magnetic force. This result is a smaller and lighter sensor, generating a cleaner signal.

There are many ways to identify the vehicle speed signal:

11.1.3.1 Using an Oscilloscope

Using an Oscilloscope is the easiest way to view and identify the VSS signal. It shows a picture of the signal.

11.1.3.2 Using a Multi-Meter to Measure Frequency (Hz)

This is the easiest way to measure the speed signal without the use of an O-scope, but watch out for some things. The meter may give incorrect readings at rest. The meter uses A/C coupling to measure frequency, so it may try to measure noise to determine its frequency. It is most important to measure frequency while the vehicle is moving. The frequency increases proportionately to vehicle speed. If the measurements seem to bounce around, you probably do not have the correct circuit.

11.1.3.3 Using a Multi-Meter to Measure A/C Voltage

This is another way to verify the VSS circuit. This method works poorly with Hall Sensor outputs. This is because a Hall Sensor's output varies in frequency but not amplitude. Most A/C Multimeters display voltage in RMS, which is about 70% of the peak value of the A/C waveform. Since the peak voltage is constant with a Hall Sensor, you will see only two readings; the reading while the vehicle is stationary, and the reading while it is in motion. This is usually enough data to determine if you have the right circuit.

Using an A/C Multimeter to test a variable reluctance sensor, which are the most common, will work very well. As with frequency, A/C voltage should fluctuate in direct proportion to the vehicle speed.

Upon identifying the VSS circuit, then determine the number of pulses per mile that the sensor emits. To determine the speed and mileage, the FJ3 must know how many pulses are emitted for a mile traveled. There are only a few different calibration values. **Most Ford and Chrysler products emit 8,000 pulses per mile. GM commonly uses 4,000 at the control module, and 96000 at the transmission.**

11.1.3.4 Electronic Odometer Adapter

If the vehicle is equipped with an electronic sending unit controlling the dashboard speedometer, simply connect a wire between the signal line and the FJ3. If the vehicle's electronic odometer line is also driving additional equipment, such as a cruise control module or trip computer, there may not be enough signal strength to add the FJ3 to this line. In this case, you must replace the single sensor with a dual output sender or add an additional single sender to the unused sender port provided on some vehicles.

For connection instructions please refer to vehicle manufacturer.

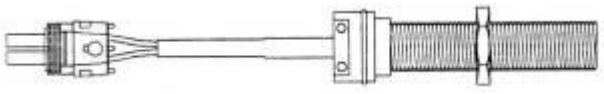


Figure 16 Single Electronic Adaptor

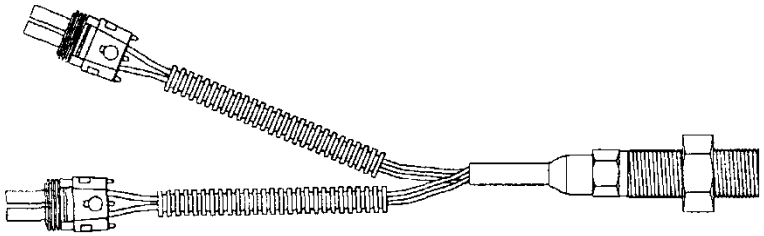


Figure 17 Dual Electronic Adaptor

11.1.3.5 Reed Type Mechanical Adaptor

A mechanical pulse Transducer (or taxi Tap) is required if the vehicle utilizes a mechanical cable between the dashboard speedometer and the transmission. Try to order the sensor with an 18 AWG shielded cable of sufficient length to reach the ID Box without splicing.

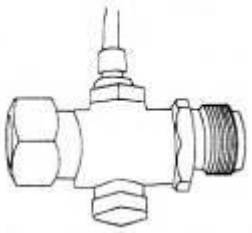


Figure 18 Reed Type Mechanical Adaptor

11.2 Appendix B: CAN Bus Data Connectors

11.2.1 Vehicle OBD-II Connector J1962

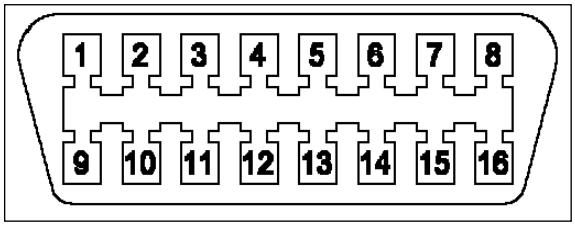


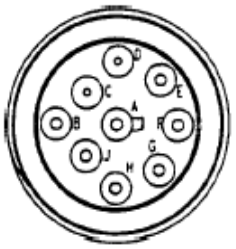
Figure 19: Car Diagnostic Connector (female)

Pin No.	Description
1	Manufacturer mandated
2	J1850 Bus+
3	Manufacturer mandated
4	Car ground
5	Signal ground
6	CAN High (J-2284)
7	ISO 9149-2 K output
8	Manufacturer mandated
9	Manufacturer mandated
10	J1850 Bus
11	Manufacturer mandated
12	Manufacturer mandated
13	Manufacturer mandated
14	CAN Low (J-2284)
15	ISO 9149-2 L output
16	Battery (+) voltage

Table 1: OBD-II Connector J1962 – Pin Description

11.2.2 SAE J1939 Data Interface Connector

Function	Wire Color	Pin
Battery (-) GND	Blue	1/A
Battery (+)	Orange	2/B
CAN_H	Black	3/C
CAN_L	White	4/D
CAN_SHLD	Red	5/E
J1708 (+) Data (A)	Green	6/F
J1708 (-) Data (B)	Brown	7/G
Proprietary	N/C	8/H
Proprietary	N/C	9/J



View into 1708CAB9 Connector

Figure 20: SAE J1939 Model 1708CAB9

11.2.3 3 PIN J1939 Data Interface Connector

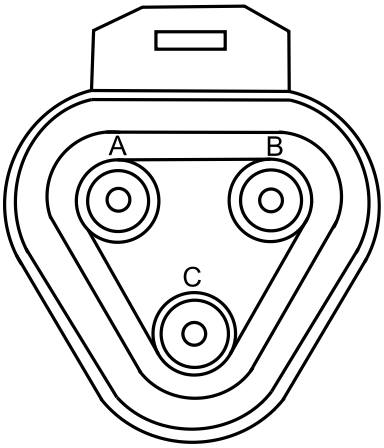


Figure 21: 3-pin Deutsch J1939 DT06-3S-E008

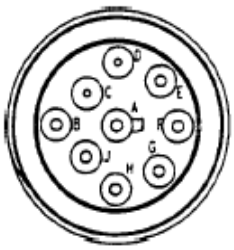
Pin No.	Description
A	CAN bus line, dominant Low (J-1939)
B	CAN bus line, dominant High (J-1939)
C	CAN ground (Car ground)

11.3 Appendix C: J1708 Data Connectors

11.3.1 SAE J1708 Data Interface Cables

Option 1: SAE J1708 Model 1708CAB9

Function	Wire Color	Pin
Battery (-) GND	Blue	1/A
Battery (+)	Orange	2/B
CAN_H	Black	3/C
CAN_L	White	4/D
CAN_SHLD	Red	5/E
J1708 (+) Data (A)	Green	6/F
J1708 (-) Data (B)	Brown	7/G
Proprietary	N/C	8/H
Proprietary	N/C	9/J



View into 1708CAB9 Connector

Figure 22: SAE J1708 Model 1708CAB9

Option 2: SAE J1708 Model 1708CAB

Function	Wire Color	Pin
Data A (+)	Orange	A
Data B (-)	Yellow	B
Ground	Black	E
V + (9-32 volts)	Red	C
No standard function	Green	D
No standard function	Brown	F

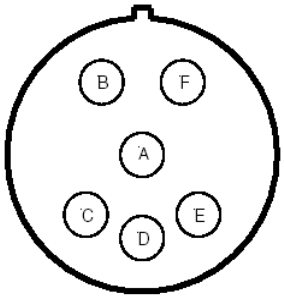


Figure 23: SAE J1708 Model 1708CAB

11.4 Appendix H: The FCC Wants You to Know

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if the equipment not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

a) Reorient or relocate the receiving antenna.

b) Increase the separation between the equipment and receiver.

c) Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

d) Consult the dealer or an experienced radio/TV technician.

FCC Warning

To comply with FCC requirements, a distance of at least 20cm between the equipment and all persons should be maintained during the operation of the equipment.

Modifications not expressly approved by the manufacturer could void the user authority to operate the equipment under FCC Rules.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.
(2) This device must accept any interference received, including interference that may cause undesired operation.