



HMMWV AFES Training



HMMWV Automatic Fire Extinguishing System (AFES) Brief

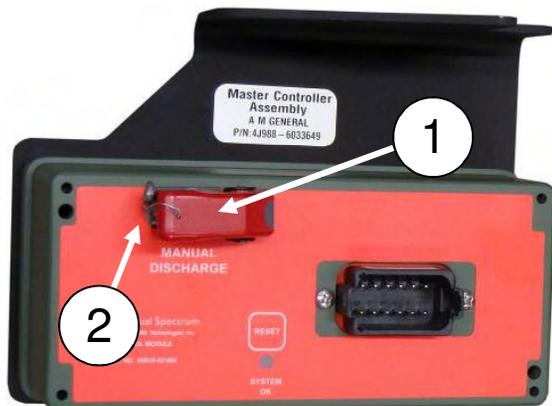


Overview

- The Automatic Fire Extinguishing System (AFES) produced by Kidde Aerospace & Defense provides protection for the crew and cargo compartments and is capable of detecting and suppressing hydrocarbon fuel fires and explosions initiated by various threats.
- The system utilizes optical fire sensors and fire extinguishers that automatically respond to a vehicle fire and/or a POL (Petroleum, Oil, and Lubricant) explosion within milliseconds reducing or eliminating casualties to embarked troops and minimizing combat damage to equipment.



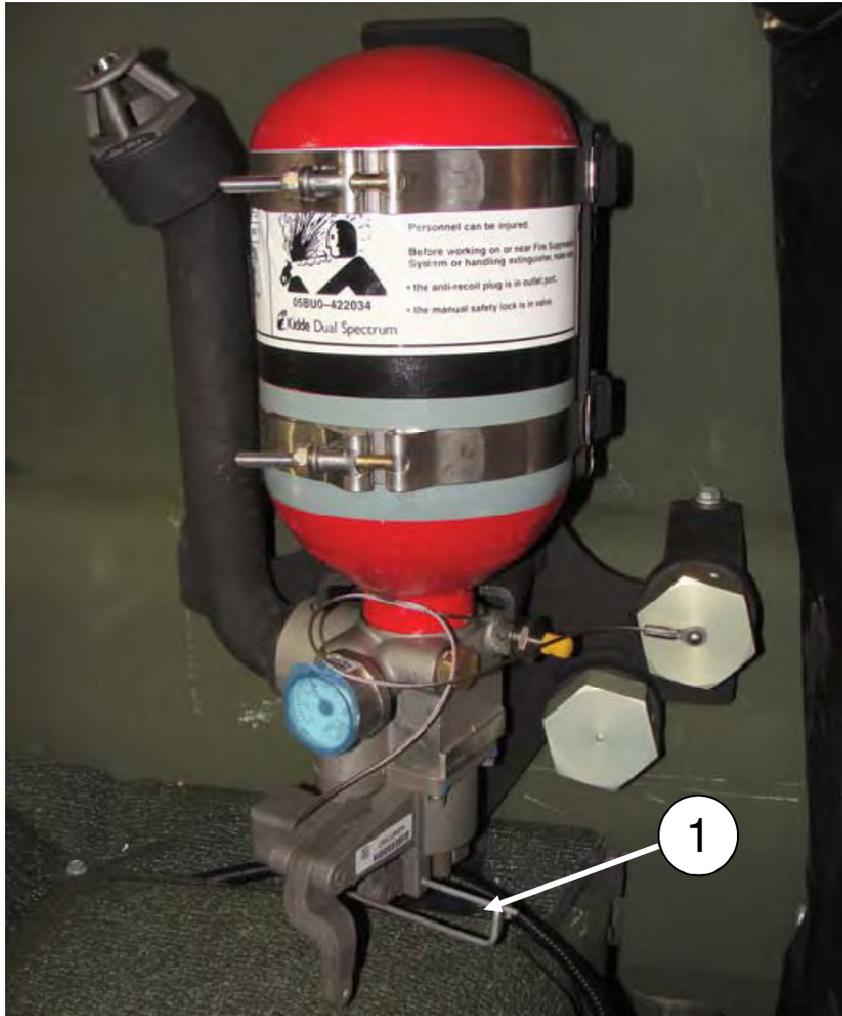
AFES Master Control Assembly



- The Control Module electronically integrates the system extinguisher(s), sensors, and controls for the crew and, if equipped the cargo compartment AFES bottles. The Control Module manages system operation, and provides system supervision.
- The manual discharge switch (1), if depressed, will discharge the AFES bottle(s). This switch should only be used if the system does not automatically activate (discharge) to suppress a vehicle fire.
- To prevent accidental tripping of the AFES, the manual discharge switch is equipped with a safety wire (2). If the safety wire on the switch has been removed or damaged it must be replaced.



AFES Bottle Locking Pin

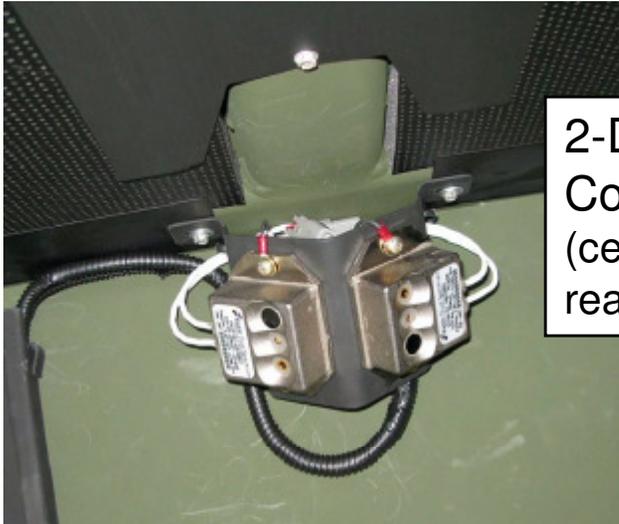


- The locking pin (1) installed on the AFES bottle protects against accidental discharge. Since the same valve assembly is used in other applications it has the provision for a mechanically actuated discharge. This allows for fires to be suppressed manually when the AFES system is not active.

**WARNING
AFES LOCKING PIN SHOULD
REMAIN IN PLACE AT ALL
TIMES**



AFES Sensor Operation



2-Door
Configuration
(centered on
rear bulkhead)

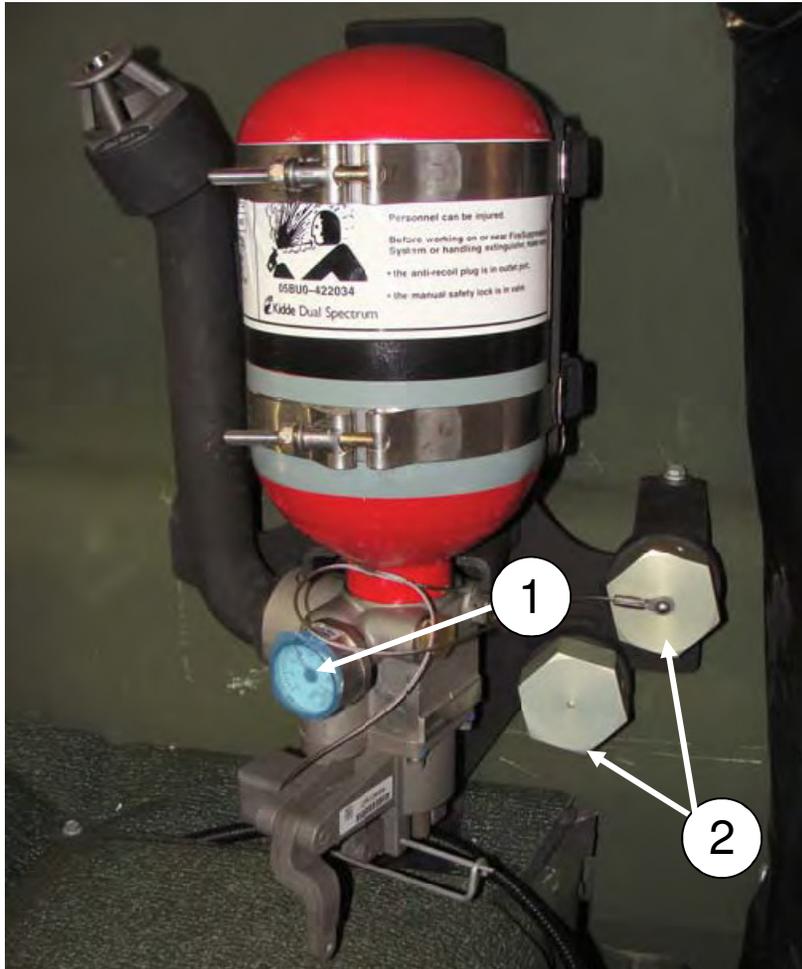
- The sensor consists of one detector sensitive to short infrared wavelength radiation and one detector sensitive to long wavelength infrared radiation
- The sensor is very immune to false alarms since most non-fire stimuli do not radiate in both spectral bands as a fire does.
- A front mounted LED indicates sensor operational status (ON/OFF) and fire detection (blinking).



4-Door
Configuration
(located on
both B-Pillars)



AFES Bottle Pressure



- The gauge (1) on the extinguisher valve indicates internal pressure
- Minimum operational pressures at various temperatures are indicated on the extinguisher label (shown below)
- The extinguisher valve contains a pressure switch that will activate if the pressure drops very low, as in the case of a discharge and communicates with the Control Module to indicate a fault.
- **Warning: Only remove/replace AFES bottle if appropriate Anti-Recoil Device (2) is in place**

TEMP. °F	-40	-22	-4	14	32	50	68	86	104	122	140	158
TEMP. °C	-40	-30	-20	-10	0	10	20	30	40	50	60	70
P min, PSIG	585	620	655	690	730	770	810	850	905	955	1005	1060



System Breakdown

Discharge Tube
Anti-Recoil Plug



Discharge Tube

Fire Extinguisher
Bottle

Pressure Gauge

J3/Control Valve
Connector

Manual
Discharge

Diffuser
Nozzle



Fire Extinguisher
Valve

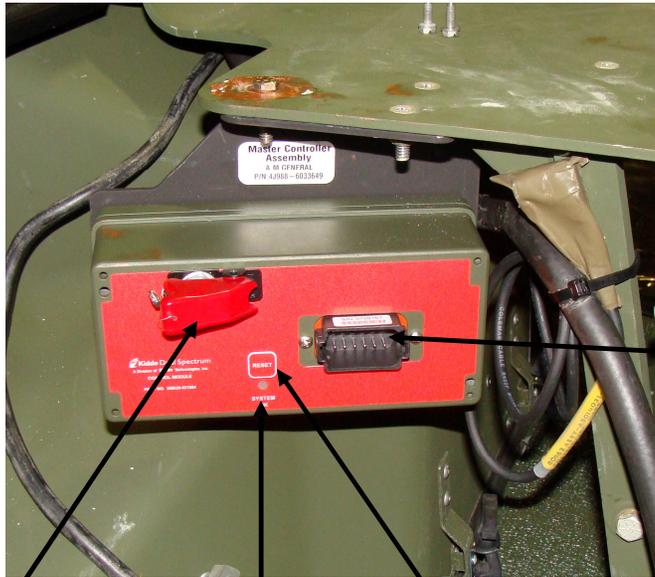
Manual
Discharge
Lock Pin

Valve Anti-
Recoil Plug



System Breakdown

AFES Master Controller



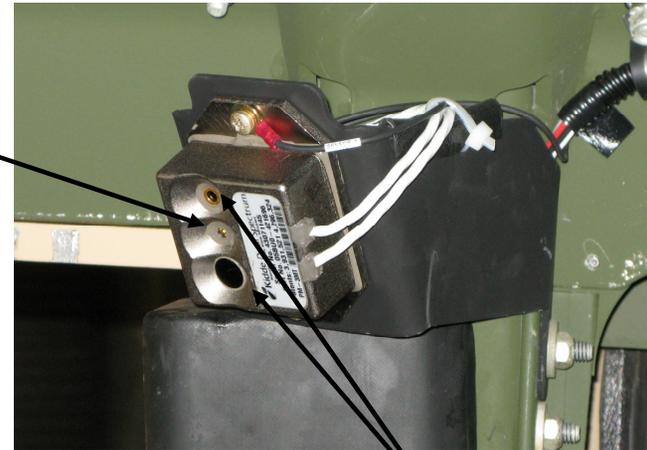
Manual Discharge Switch

System Status Light

System Reset Button

J1 Connector

System Sensor



Sensor Status Light

Optical Sensors



M1114 UAH AFES Configuration

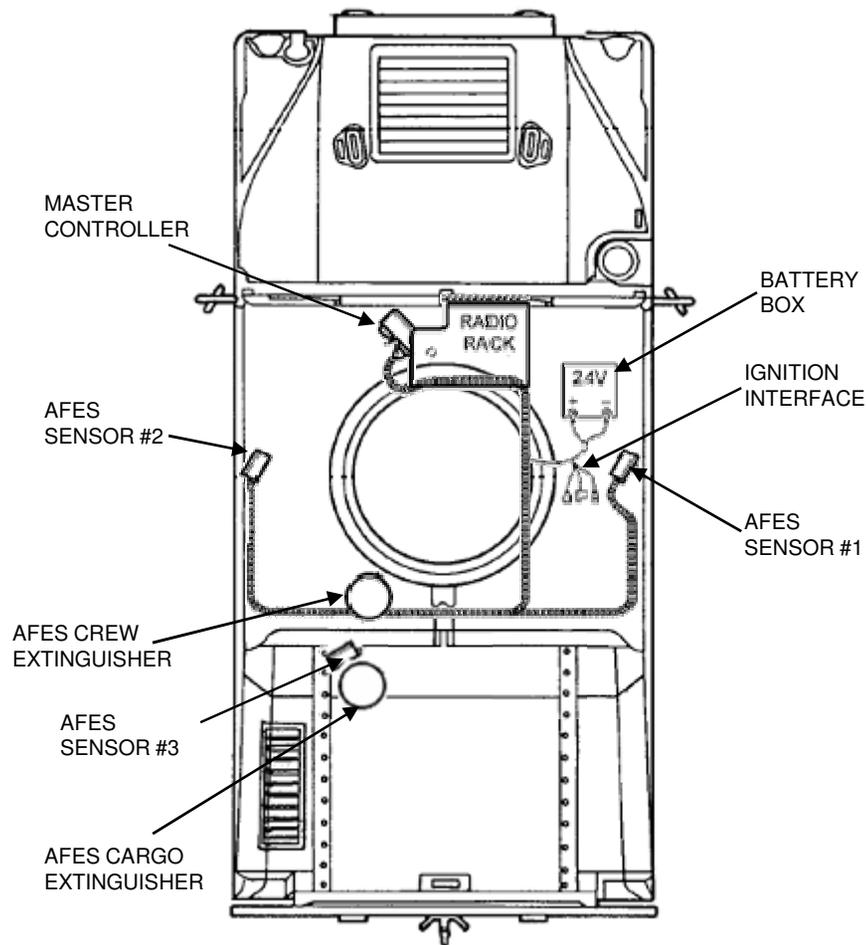
Crew Extinguisher

Cargo Extinguisher



Master Controller

Crew Compartment Sensor

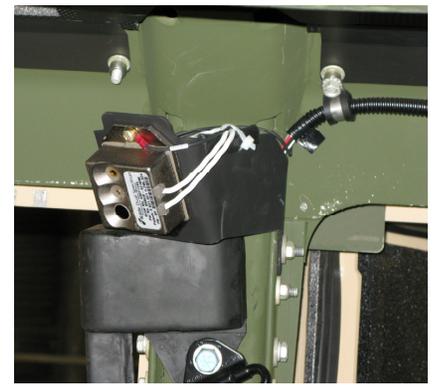




M1151A1 AFES Configuration

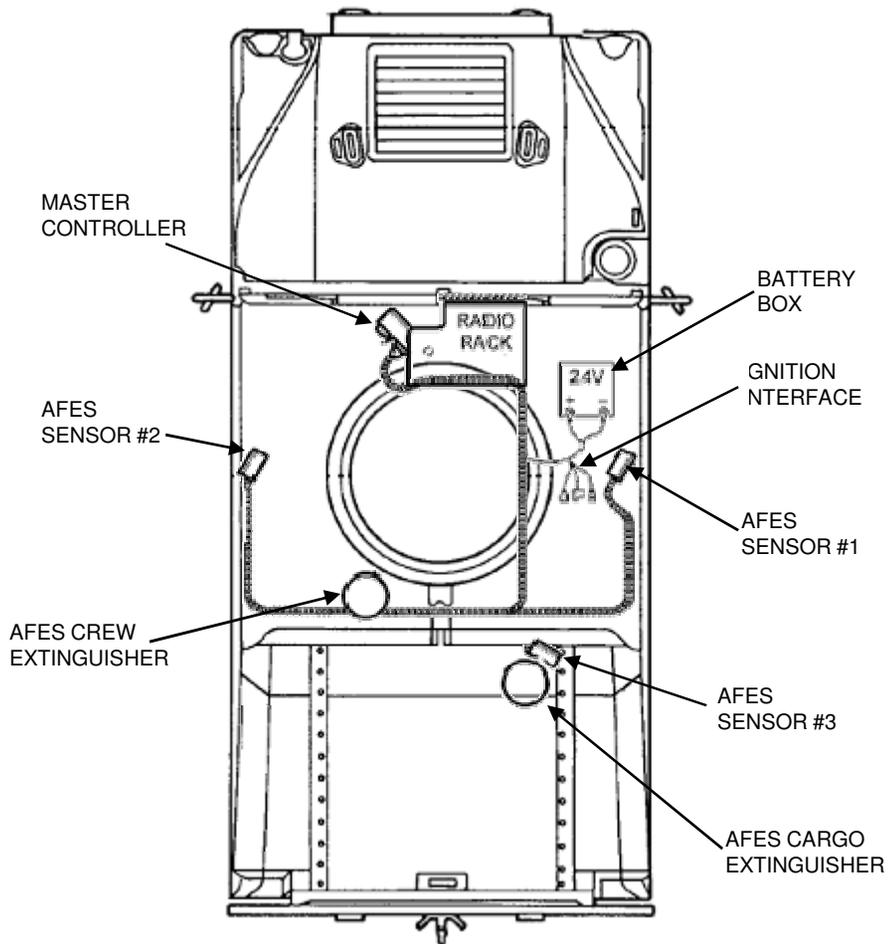
Crew Extinguisher

Cargo Extinguisher



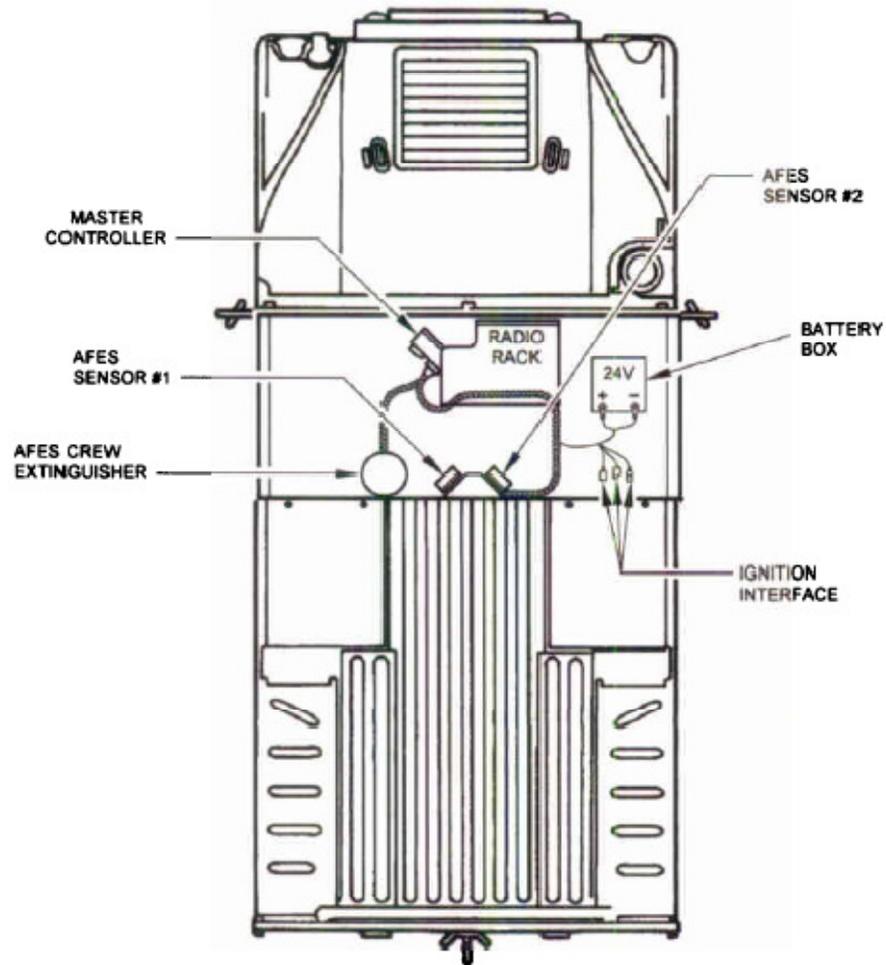
Master Controller

Crew Compartment Sensor





M1152A1 Configuration



Crew Extinguisher



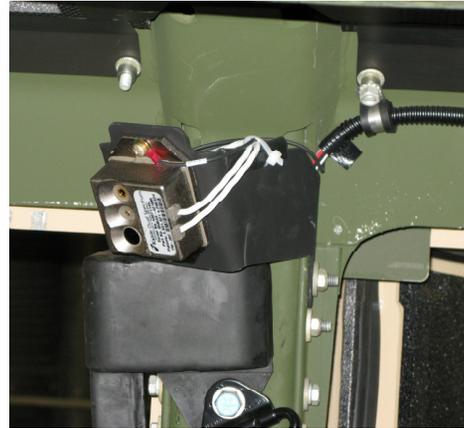
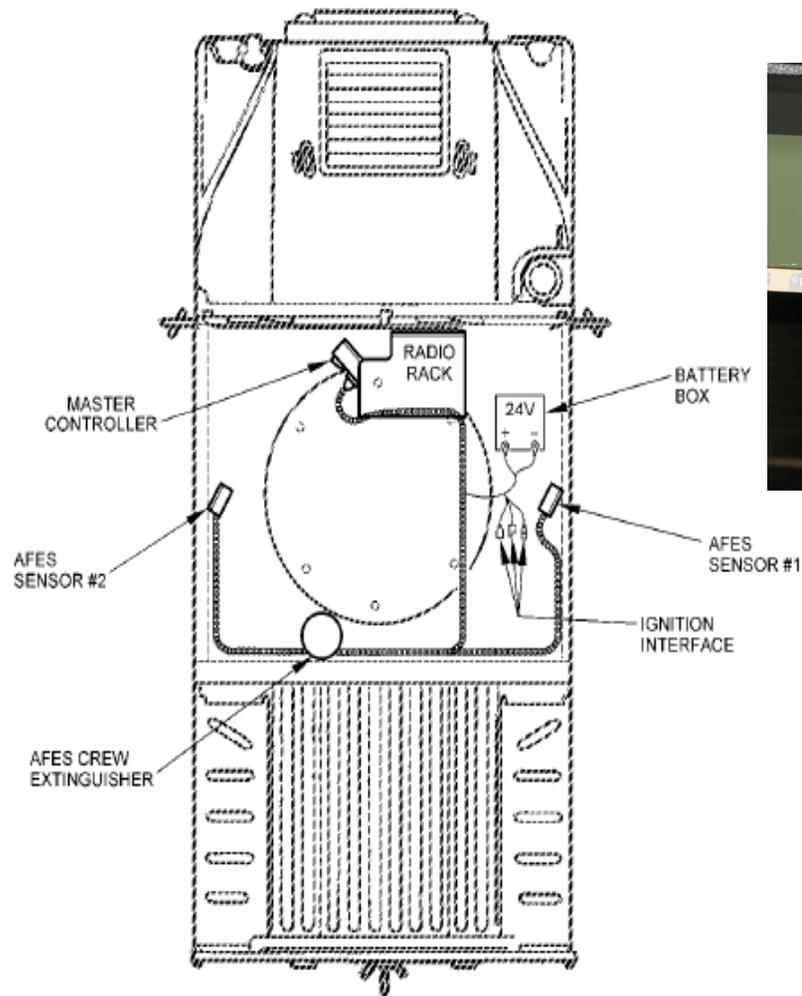
Crew Sensor



Master Controller



M1165A1 Configuration



Crew Sensor



Crew Extinguisher



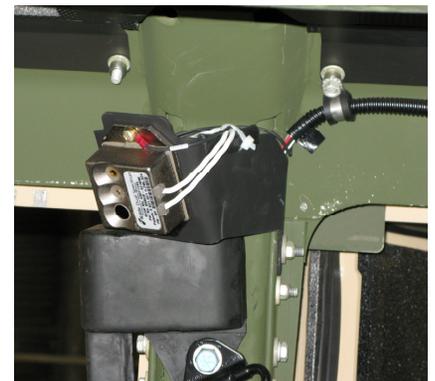
Master Controller



M1167 AFES Configuration

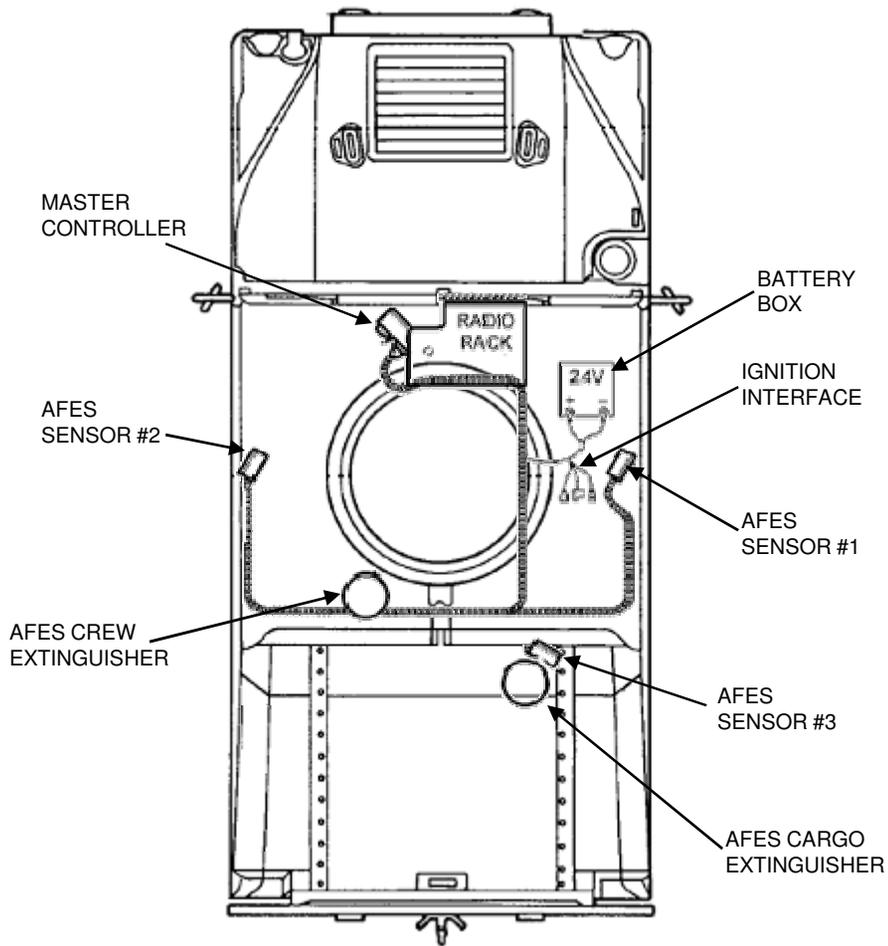
Crew Extinguisher

Cargo Extinguisher



Master Controller

Crew Compartment Sensor





General Maintenance

- In order to de-activate the AFES during maintenance activities with the ignition switch ON, disconnect the interface connector on the Control Module.
 - **Daily (With ignition switch on)**
 - Control Module
 - Verify that the 'SYSTEM OK' LED is on solid green
 - Optical fire sensors
 - Verify status LED on the detector face is on solid green
 - Verify nothing is blocking the detector's field of view
 - Verify the windows on the face of the detector are free of excess contamination (dirt, oil, grease, etc) - if necessary, clean with a damp, non-abrasive cloth.
 - Extinguisher & Distribution System
 - Verify the extinguisher minimum pressure gauge reading is at or above the minimum pressure indicted on the extinguisher label for the ambient temperature.
 - Verify distribution piping and nozzles are intact and unobstructed
 - **Monthly**
 - Perform Daily checks plus the following.
 - **Manual Activation Switch**
 - Verify tamper seal is intact and access to switch is unobstructed.
 - **Electrical Harness**
 - Verify electrical connectors and electrical wiring have no visible damage and all connectors are securely seated.
 - **Semi-Annually**
 - Perform Monthly tests as described above.
 - Perform a Functional Test as described.



Functional Test

- The Functional Test verifies proper installation and operation of the Automatic Fire and Extinguishing System (AFES) the vehicle. This test is to be performed after the installation of the AFES and repeated during normally scheduled vehicle maintenance. AFES Test Set NSN 4210-01-543-5510 P/N 421762 is used to conduct these tests along with the AFES Test Set 421762 Operational Instructions for the ECV.

WARNING
BEFORE TESTING THE AFES, CABLES FROM
BOTH EXTINGUISHERS MUST BE
DISCONNECTED AND
VALVE SIMULATORS INSTALLED



Field Maintenance

- If a sensor malfunctions and a replacement is not available, the faulty sensor may be electrically isolated from the system. To isolate the sensor, disconnect the two harness connectors from the sensor and reconnect the harness connectors to each other. This procedure may be done with the AFES power on or off. The remainder of the AFES will function normally. For full AFES functionality, replace the sensor at the first opportunity.



AFES Sensor False Positive Chart

Stimuli	Exposure Distance from Sensor
Sunlight	No Response
Bright colored clothing, including red and safety orange, illuminated by sunlight	No Response
Flashlight (3-D Maglite) with and without red filter	No Response
Indirect or reflected light (combination of above)	No Response
Chopped light (combination of above simulating hatch cover opening, vent fans, personnel, or cargo movement)	No Response
Fluorescent light (40W)	<1 inch (in.)
Vehicle headlights	<1 in.
Incandescent light (100 W frosted)	<1 in.
Quartz Halogen (650 W)	8 in.
Sodium Vapor Lamp (70 W)	<1 in.
Electronic flash (Sunpak 422D)	<1 in.
Arc welding (5/32 in. Steel rod, 160 A)	6 in.
Radiation heater (1,500 W)	16 in.
Forced Air Heater (1,500 W)	≤4 in.
Lighted cigar or cigarette	2 in.
Book match flare-up	2 in.



Fault Conditions

- A blinking green or unlit LED on the Control Module with the ignition switch ON indicates a fault condition. Either one or more of the system components are not properly connected or a fire suppression event has occurred. The fault conditions are as follows:
 - **Steady Blink** (on 1/4 second, off 1/4 second)
 - Disconnected sensor, extinguisher or End of Line Device; harness short or open; or low extinguisher pressure.
 - Check and connect all system components to the wiring harness and verify that the “SYSTEM OK” LED indicates steady green.
 - **Double Blink** (on 1/5 second, off 1/5 second, on 1/5 second, off 1.4 seconds)
 - Indicates less than 18 Vdc or more than 32 Vdc to Control Module.
 - Correct system voltage.
 - **Slow Blink** (on 9 seconds, off 1 second)
 - Indicates a manual discharge has been recorded in history and not reset. The AFES will operate normally in this mode.
 - After replacing both fire extinguishers with recharged units, press and hold the reset button on the Control Module, then turn the ignition ON to reset the manual discharge history indication.
 - **All LEDs Off**
 - Indicates loss of supply power or 29T interface voltage.
 - Correct system voltage.