

## Slash Fuel Costs, Reduce Emissions and Noise with EMD AESS™

EMD AESS is a fully integrated software solution that monitors critical operating parameters during locomotive idle operation—safely and effectively shutting down the engine when all factors are satisfied. When any one of the predetermined limits falls outside of the target range, AESS will restart the engine.

EMD AESS provides superior fuel and lube oil savings, reducing emissions and wayside noise, while keeping the locomotive in a ready-to-use condition. It complies with the latest AAR S-5502 standard and allows for individual customization to meet railroad operating and safety requirements.

The EMD AESS reduces unnecessary idle time by more than 50% and improves locomotive fuel efficiency up to 29 gal/day for switcher use and 18 gal/day for line haul operation.

Unlike non-OEM products, the EMD AESS is a software driven solution that simplifies installation and eliminates the maintenance of unnecessary additional equipment. It also ensures that the system cannot be intentionally disabled—allowing it to operate as designed while maximizing shutdown time. Detailed system performance data is available via the RS232 port. Report information includes operational details including auto start totals, shutdown prevention and engine restart historical data.

The EMD AESS system quickly pays for itself with reductions in fuel, maintenance and operating expenses.



Photo depicts the AESS status portion of the engine control panel.

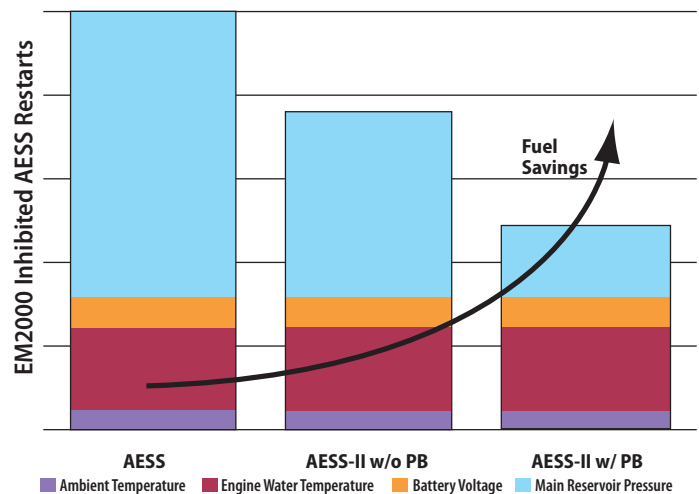
### EMD AESS™ Savings per Locomotive

Year	AESS Net Savings-SW Duty Cycle	AESS Net Savings-LH Duty Cycle
1	\$25,646	\$15,864
2	\$26,451	\$16,375
3	\$27,281	\$16,903
4	\$28,135	\$17,446
5	\$29,015	\$18,005
6	\$29,922	\$18,581
7	\$30,855	\$19,175
8	\$31,817	\$19,786
9	\$32,807	\$20,415
10	\$33,828	\$21,064
Total	4295,756	\$183,617

Assumptions: 16-645E baseline, \$2.50 fuel, 3% annual escalation, net savings is calculated as fuel savings less AESS related maintenance

## AAR S-5502 Changes Decrease Restarts and Increase Fuel Savings

- ✓ Parking Brake Applied Indication – Eliminates 50 to 75% of restarts due to main reservoir pressure
- ✓ Set up for isolated units in consist & lead trail pneumatic status–ignores request from train line and independent brakes allowing the engine to stay shut down
- ✓ Elimination of speed as a start up requirement– allows movement of locomotives without having the engine cycle
- ✓ Monitor main reservoir 2 as parameter– Fewer leaks allows for longer shutdown



## System functions & operating conditions

### SET-UP CONDITONS

- ✓ Reverser centered
- ✓ Locomotive not moving
- ✓ Locomotive brakes applied
- ✓ Main reservoir pressure > brake pipe pressure

### RESTART CONDITIONS

- ✓ Engine water temperature
- ✓ Battery voltage
- ✓ Air pressure
- ✓ Reverser direction
- ✓ Independent brakes released
- ✓ Excess shutdown (over 47 hrs)
- ✓ Main reservoir pressure
- ✓ Temperature at water drain valve
- ✓ Operator requested

### SHUTDOWN CONDITONS

- ✓ Engine water temperature level
- ✓ Battery charging current < 20 amps
- ✓ Battery voltage > 71V (10 minutes minimum)
- ✓ Air pressure (programmed setting)
- ✓ Engine run time (20 minute minimum)
- ✓ Switching mode for separate road and yard delay times

### PREVENTION CONDITIONS

- ✓ Active engine shutdown fault
- ✓ Engine shutdown request
- ✓ Any control input that inhibits start
- ✓ Any failed system feedback signals
- ✓ Manual engine shutdown (requires manual restart)