Installation Instructions for:
EMS P/N 30-1800
1993-1995 Mazda RX-7

WARNING:

This installation is not for the tuning novice nor the PC illiterate! Use this system with <u>EXTREME</u> caution! The AEM EMS System allows for total flexibility in engine tuning. Misuse of this product can destroy your engine! If you are not well versed in engine dynamics and the tuning of management systems or are not PC literate, please do not attempt the installation. Refer the installation to a AEM trained tuning shop or call 800-423-0046 for technical assistance. You should also visit the AEM EMS Tech Forum at http://www.aempower.com

NOTE: AEM holds no responsibility for any engine damage that results from the misuse of this product!

This product is legal in California for racing vehicles only and should never be used on public highways.

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Instruction Part Number: 10-1800

Congratulations! You have just purchased the finest Engine Management system for your car at any price!

The AEM Engine Management System (EMS) is the result of extensive development on a wide variety of cars. Each system is engineered for the particular application. The AEM EMS differs from all others in several ways. The EMS is an all new stand alone system, which completely replaces the factory ECU and features unique Plug and Play Technology, which means that each system is configured especially for your make and model of car. There is no need to modify your factory wiring harness and in most cases your car may be returned to stock in a matter of minutes. The AEMPro software is configured to work with the factory sensors and equipment, so that there is no need for expensive or hard to find sensors, making replacement and repairs as simple as with an unmodified car. For stock and some slightly modified cars, the AEMPro software will be preprogrammed with a set of base parameters, providing a starting point for individual tuning. For more heavily modified cars, the EMS has many spare inputs and outputs allowing the elimination of separate rev-limiters, boost controllers, nitrous controllers, and fuel computers. The EMS includes a configurable onboard data logger capable of recording 512kb of information. Every EMS comes with all functions installed and activated, and there are no expensive options or upgrades to be performed.

The installation of the AEM ECU on the 1993-1995 Mazda RX-7 uses the stock sensors and actuators. The base map is automatically installed in the calibrations directory in the AEMPro directory on your computer. It is named 1800.V1.00.CAL.

Full details of the test vehicle used to generate this map can be found in the files notes section. However, while the base map is a good starting point and may save you considerable time and money, it will not replace the need to tune your specific application. It is not intended to be driven aggressively. Ignoring this can and will damage your engine.

Please visit the AEM EMS Tech Forum at http://www.aempower.com and register. We always post the most current strategy release, PC Software and base calibrations online. On the forum, you will find many helpful hints/tips to make your EMS perform it's best.

Read and understand these instructions <u>BEFORE</u> attempting to install this product.

1) Removing the Stock Engine Control Unit
   a) Access the stock Engine Control Unit (ECU). The location of the ECU on the RX-7 is in the passenger fenderwell.
   b) Carefully disconnect the wiring harness from the ECU. Avoid excessive stress or pulling on the wires, as this may damage the wiring harness. Some factory ECU's use a bolt to retain the factory connectors, and it must be removed before the harness can be disconnected. There may be more than one connector, and they must all be removed without damage to work properly with the AEM ECU. Do not cut any of the wires in the factory wiring harness to remove them.
   c) Remove the fasteners securing the ECU to the car body, and set it aside. Do not destroy or discard the factory ECU, as it can be reinstalled easily for street use and troubleshooting.

2) Install the AEM Engine Management System.

a) Plug the factory wiring harness into the AEM ECU, and position it so that the wires are not pulled tight or stressed. Secure it with the provided Velcro fasteners.
b) Plug the comms cable into the EMS and into your PC.
c) Turn your ignition on but do not attempt to start the engine.
d) Upload the base calibration file (.cal) that most closely matches your vehicle's configuration. (These files can be found in the AEMPro/Base Calibrations/Mazda folder on your computer's hard drive)
e) Set the throttle range: Select the *Configure* drop down menu, then *ECU Setup* | *Set Throttle Range* and then follow the direction given on the screen.
f) Verify the ignition timing by selecting the *Configure* drop down menu, then *ECU Setup* | *Set Ignition*. Use a timing light and compare the physical timing numbers to the Parameter *Ignition Timing* displayed. Use the *Advance/Retard* buttons to make the timing number match.

3) You are now ready to begin tuning your vehicle.
a) Note: This calibration needs to be properly tuned and is not recommended for street use. NEVER TUNE YOUR VEHICLE WHILE DRIVING.

Application Notes for EMS P/N 30-1800
1993-1995 Mazda RX-7

Make:	Mazda
Model:	RX-7
Years Covered:	1993 – 1995
Engine Displacement:	1.3L
Engine Configuration:	2 Rotor
Firing Order:	1 (t)-2(t)
N/A, S/C or T/C:	T/C
Load Sensor Type:	MAP
Map Min:	1.09V @ -11.7 PSI
Map Max:	4.98V @ 18 PSI
# Coils:	** 3
Ignition driver type:	0-5V Logic
How to hook up a CDI:	Wire after igniter
# Injectors:	4 (Inj 1-4)
Injector Flow Rate:	550/850 cc/min
Injector Resistance:	10-15 Ω
Injection Mode:	Sequential
Knock Sensors used:	1
Lambda Sensors used:	1
Idle Motor Type:	PW
Main Relay Control:	No
Crank Pickup Type:	Mag
Crank Teeth/Cycle:	12
Cam Pickup Type:	Mag
Ref Teeth/Cycle:	1
Transmissions Offered:	M/T, A/T
Trans Supported:	M/T Only
Drive Options:	RWD

Supplied Connectors:	Spare pins
Spare Injector Drivers:	Inj #10, Pin A11
Spare Injector Drivers:	---
Spare Injector Drivers:	---
Spare Injector Drivers:	---
Spare Injector Drivers:	---
Spare Injector Drivers:	---
Spare Coil Drivers:	---
Spare Coil Drivers:	---
Spare Coil Drivers:	---
Spare Coil Drivers:	---
Boost Solenoid:	PW #2, Pin 4U
EGT #1 Location:	Pin 3J
EGT #2 Location:	Pin 3G
EGT #3 Location:	--
EGT #4 Location:	Pin 2I
Spare 0-5V Channels:	Pr Press, Pin 2F
Spare 0-5V Channels:	--
Spare 0-5V Channels:	--
Spare Low Side Driver:	--
Spare Low Side Driver:	--
Spare Low Side Driver:	--
Spare Low Side Driver:	--
Check Engine Light:	Low Side #10, Pin 1D
Spare Switch Input:	--
Spare Switch Input:	Switch #3, Pin 1I
A/C Switch Input:	Switch #6, 1E
Clutch Switch Input:	Switch #4, Pin 1Q

Notes:

INSTALLATION NOTES: 30-1800

As you are probably aware, the 93+ RX7's have an electronically controlled oil metering pump that injects oil into the Rotor Housing directly proportional to the amount of fuel coming in to the engine. The mix ratio is controlled in software against the duty cycle of the STOCK injectors. It is IMPERATIVE that when changing injector sizes to reconfigure the mix. The factory oil metering pump will only flow so much oil at 100% duty, so adding oil directly to the gasoline may be necessary. To calculate the change necessary to the Oil Metering pump Step#2 target table, use the following formula

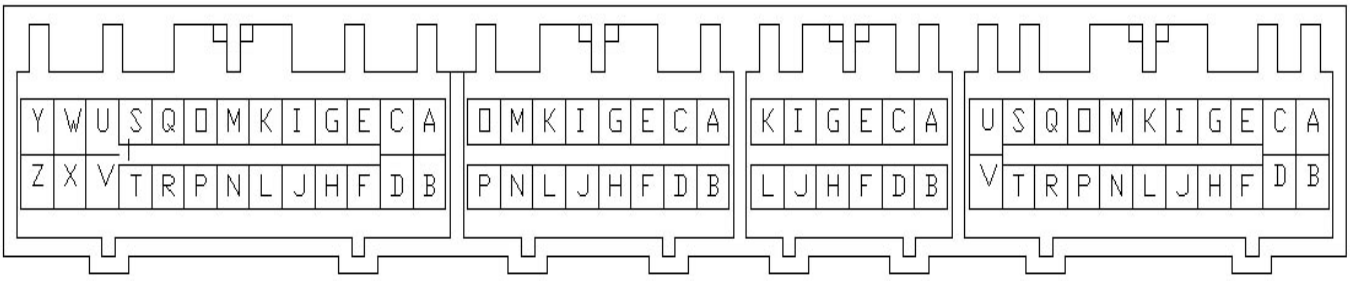
Take the percentage of total fuel increase (not just secondary fuel but total fuel), highlight the entire Step#2 target table, right click over the highlighted table, select percentage change. For setting the proper percentage change, remember you want a percentage of what you already have, so 100 is no change, 150 would give a 50% increase, 80 would decrease the table by 20% etc. NOTE: When you are at 100% in the table, note at what duty this occurs. If you reach that % duty in your fuel map, at that point you will need to begin adding pre-mix to your gas tank. Your desired mix ratio will be 100 to 1 and there are several ways to approach this. AEM recommends that you pre-mix the fuel in your tank at a ratio of 200 to 1, and then decrease your Oil metering pump Step#2 table by 50% of the Original numbers supplied with the base map from AEM. So again, you would go into the Step#2 table and highlight the entire table, right click, select percentage change, enter 50, hit ok, and you are done.

Connection Diagram for EMS P/N 30-1800
1993-1995 Mazda RX-7

PnP	Means the Plug and Play system comes with this configured for proper operation of this device. Is still available for reassignment by the end user.
Avail	Means the function is not currently allocated and is available for use
Dedicated	Means the location is fixed and cant be changed

Pin #	93-95 RX7	AEM PEMS P/N 35-1800	I/O	RX7 Notes
4A	CHASSIS GROUND	rtn	Output	Dedicated
4B	CHASSIS GROUND	rtn	Output	Dedicated
4C	CHASSIS GROUND	rtn	Output	Dedicated
4D	SENSOR GROUND	agnd	Output	Dedicated
4E	CYLINDER REF PULSE	crank	Input	Dedicated
4F	SOL SPLIT AIR BYPASS	LS2	Output	PNP for split air bypass
4G	TDC REF TRIGGER	cam	I	Dedicated
4H	TIMING SENSOR GROUND	tgnd	Output	Dedicated
4I	OIL METERING PUMP	idle5	Output	Dedicated
4J	OIL METERING PUMP	idle7	Output	Dedicated
4K	OIL METERING PUMP	idle6	Output	Dedicated
4L	OIL METERING PUMP	idle8	Output	Dedicated
4M	SOL PRESS CONTR	inj5	Output	PNP for solenoid press contr
4N	SOL SWITCH VALVE	inj6	Output	PNP for switch valve
4O	SOL EGR	inj7	Output	PNP for EGR
4P	AWS SOL	inj8	Output	PNP for AWS solenoid
4Q	IDLE SPEED CONTROL VALVE	pw1i	Output	Dedicated
4R	Turbo Main Exhaust control	LS1	Output	PNP for TT Exhaust control
4S	SOL VALVE CHARGE RELIEF	LS5	Output	PNP for charge relief
4T	Charge Control (Intake valve for turbo)	HS3	Output	PNP for Intake control
4U	BOOST CONTROL SOL	pw 2	Output	PNP for Boost control
4V	Turbo Pre control (pre-spools 2nd turbo)	LS3	Output	PNP for turbo pre-control
4W	FRONT PRIMARY INJ	inj1	Output	Dedicated
4X	FRONT SECONDARY INJ	inj3	Output	Dedicated
4Y	REAR PRIMARY INJ	inj2	Output	Dedicated
4Z	REAR SECONDARY INJ	inj4	Output	Dedicated
3A	OIL METERING PUMP position sensor	maf	Input	Dedicated
3B	E/L UNIT	EGT 3-	N/U	
3C	O2 INPUT	Lambda1	Input	Dedicated
3D	COOLING FAN RELAY	LS8	Output	Dedicated
3E	COOLANT TEMP SENSOR	coolant	Input	Dedicated
3F	TPS INPUT	tps	Input	Dedicated
3G	TPS WIDE OPEN INPUT	EGT 2	Output	Available input (0-5v)
3H	PURGE CONTROL	LS4	Output	PNP for purge control
3I	TPS 5V REF	v50	Output	Dedicated
3J	EGR (Input)	EGT 1	Input	Available input (0-5v)
3K	RELIEF 2 SOL.	HS2	Output	PNP for relief sol 2
3L	AIR TEMP SENS.	AIR TEMP	Input	Dedicated
3M	KNOCK SENSOR	knock1	Input	Dedicated

3N	SOL VALVE PORT AIR	inj9	Output	PNP for port air
3O	SOL VALVE DOUBLE THROTTLE	LS9	Output	PNP for D throttle cont
3P	SOL VALVE REL 1	inj10	Output	PNP for relief sol 1
2A	N / U	Spare Speed	Input	Available Switch input
2B	Tachometer output	LS7	Output	Dedicated
2C	AUTO ECU	idle1	Output	N/A
2D	AUTO ECU	BARO	Output	N/A
2E	AUTO ECU	idle2	Output	Avail, Switched 12v, 1.5A max
2F	N / U	PR Press	Input	Available input (0-5v)
2G	AUTO ECU	idle3	Output	N/A
2H	N / U	HS4	Output	Available +12v switched
2I	HEAT HAZARD	EGT 4	Input	Available input (0-5v)
2J	AIR PUMP RELAY	LS12	Output	PNP for air pump
2K	1-2 SWITCH	Gear	Input	PNP gear position
2L	1-2 SEC POS SWITCH	Gear	Input	PNP gear position
1A	ROOM FUSE (JOINT BOX)	perm	Input	Dedicated
1B	switched 12v	12vs	Input	Dedicated
1C	12v+ cranking input	Coil 5	Output	Dedicated
1D	Check engine light	LS10	Output	PNP check engine light
1E	A/C input	Switch #6	Input	PNP A/C compressor relay
1F	DATA LINK / EL LOAD UNIT	Knock2	Input	Available 2nd knock sensor input
1G	IGNITOR BROWN TRAILING FRONT	Coil 2	Output	Dedicated
1H	IGNITOR LT GRN LEADING COILS	Coil 1	Output	Dedicated
1I	DATA LINK CON	Switch #3	Input	Available Switch input
1J	IGNITOR BRO/ BLK TRAILING REAR	Coil 3	Output	Dedicated
1K	FUEL PUMP	fm	Output	Dedicated
1L	A/C RELAY	LS6	Input	Dedicated
1M	SPEED SENSOR	Vehicle Speed	Input	Dedicated
1N	P/S PRESS IN	Swich #5	Input	Available Switch input
1O	PRESSURE SENSOR	Map	Input	Dedicated
1P	N / U	Switch #2	Input	Available Switch input
1Q	CLUTCH SWITCH IN	Switch #4	Input	PNP clutch switch input
1R	NEUTRAL SWITCH IN	gear	Input	PNP Neutral input
1S	STOP LIGHT SWITCH	Switch #1	Input	PNP brake input
1T	Fuel pump ecu	LS11	Output	PNP fuel pump control
1U	FUEL TEMP SENSOR	FTEMP	Input	Available input (0-5volt)
1V	N / U	Coil 4	Output	Available switch gnd, 1.5amp max



AEM Electronics Warranty

Advanced Engine Management Inc. warrants to the consumer that all AEM Electronics products will be free from defects in material and workmanship for a period of twelve months from date of the original purchase. Products that fail within this 12-month warranty period will be repaired or replaced when determined by AEM that the product failed due to defects in material or workmanship. This warranty is limited to the repair or replacement of the AEM part. In no event shall this warranty exceed the original purchase price of the AEM part nor shall AEM be responsible for special, incidental or consequential damages or cost incurred due to the failure of this product. Warranty claims to AEM must be transportation prepaid and accompanied with dated proof of purchase. This warranty applies only to the original purchaser of product and is non-transferable. All implied warranties shall be limited in duration to the said 12-month warranty period. Improper use or installation, accident, abuse, unauthorized repairs or alterations voids this warranty. AEM disclaims any liability for consequential damages due to breach of any written or implied warranty on all products manufactured by AEM. Warranty returns will only be accepted by AEM when accompanied by a valid Return Merchandise Authorization (RMA) number. Product must be received by AEM within 30 days of the date the RMA is issued.

Please note that before AEM can issue an RMA for any electronic product, it is first necessary for the installer or end user to contact the tech line at 1-800-423-0046 to discuss the problem. Most issues can be resolved over the phone. Under no circumstances should a system be returned or a RMA requested before the above process transpires.

AEM will not be responsible for electronic products that are installed incorrectly, installed in a non approved application, misused, or tampered with.

Any AEM electronics product can be returned for repair if it is out of the warranty period. There is a minimum charge of $50.00 for inspection and diagnosis of AEM electronic parts. Parts used in the repair of AEM electronic components will be extra. AEM will provide an estimate of repairs and receive written or electronic authorization before repairs are made to the product.