

Instruction Manual



INSTALLATION INSTRUCTIONS FOR EMS P/N 30-6601 1991-1993 Silvia S13 SR20DET 1991-1995 Nissan 180SX SR20DET

STOP!
THIS PRODUCT HAS LEGAL RESTRICTIONS.
READ THIS BEFORE INSTALLING/USING!

THIS PRODUCT MAY BE USED SOLELY ON VEHICLES USED IN SANCTIONED COMPETITION WHICH MAY NEVER BE USED UPON A PUBLIC ROAD OR HIGHWAY, UNLESS PERMITTED BY SPECIFIC REGULATORY EXEMPTION. (VISIT THE "EMISSIONS" PAGE AT [HTTP://WWW.SEMASAN.COM/EMISSIONS](http://www.semasan.com/emissions) FOR STATE BY STATE DETAILS.)

IT IS THE RESPONSIBILITY OF THE INSTALLER AND/OR USER OF THIS PRODUCT TO ENSURE THAT IT IS USED IN COMPLIANCE WITH ALL APPLICABLE LAWS AND REGULATIONS. IF THIS PRODUCT WAS PURCHASED IN ERROR, DO NOT INSTALL AND/OR USE IT. THE PURCHASER MUST ARRANGE TO RETURN THE PRODUCT FOR A FULL REFUND.

THIS POLICY ONLY APPLIES TO INSTALLERS AND/OR USERS WHO ARE LOCATED IN THE UNITED STATES; HOWEVER CUSTOMERS WHO RESIDE IN OTHER COUNTRIES SHOULD ACT IN ACCORDANCE WITH THEIR LOCAL LAWS AND REGULATIONS.

WARNING: This installation is not for the tuning novice! Use this system with **EXTREME** caution! The AEM EMS allows for total flexibility in engine tuning. Misuse or improper tuning of this product can destroy your engine! If you are not well versed in engine dynamics and the tuning of engine management systems **DO NOT** attempt the installation. Refer the installation to an AEM-trained tuning shop or call 800-423-0046 for technical assistance.

NOTE: All supplied AEM calibrations, Wizards and other tuning information are offered as potential starting points only. IT IS THE RESPONSIBILITY OF THE ENGINE TUNER TO ULTIMATELY CONFIRM IF THE CALIBRATION IS SAFE FOR ITS INTENDED USE. AEM holds no responsibility for any engine damage that results from the misuse or mistuning of this product!

Thank you for purchasing an AEM Engine Management System.

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 a 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 without any jumper harnesses. 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.

For stock and slightly modified vehicles, the supplied startup calibrations are configured to work with OEM sensors, providing a solid starting point for beginner tuning. For more heavily modified cars, the EMS can be reconfigured to utilize aftermarket sensors and has many spare inputs and outputs allowing the elimination of add-on rev-limiters, boost controllers, nitrous controllers, fuel computers, etc. It also includes a configurable onboard 1MB data logger that can record any 16 EMS parameters at up to 250 samples per second. Every EMS comes with all functions installed and activated; there is no need to purchase options or upgrades to unlock the full potential of your unit.

The installation of the AEM EMS on the supported vehicles uses the stock sensors and actuators. After installing the AEMTuner software, the startup calibration will be saved to the following folder on your PC:

C:\Program Files\AEM\AEMTuner\Calibrations\Nissan

Multiple calibrations may be supplied for each EMS; additional details of the test vehicle used to generate each calibration can be found in the Calibration Notes section for that file.

Please visit the AEM Performance Electronics Forum at <http://www.aempower.com> and register. We always post the most current strategy release, PC Software and startup calibrations online. On the forum, you can find and share many helpful hints/tips to make your EMS perform its best.

TUNING NOTES AND WARNING:

While the supplied startup calibration may be a good starting point and can save considerable time and money, it will not replace the need to tune the EMS for your specific application. AEM startup calibrations are not intended to be driven aggressively before tuning. We strongly recommend that every EMS be tuned by someone who is already familiar with the AEM software and has successfully tuned vehicles using an AEM EMS. Most people make mistakes as part of the learning process; be warned that using your vehicle as a learning platform can damage your engine, your vehicle, and your EMS.

Read and understand these instructions BEFORE attempting to install this product.

1) Install AEMTuner software onto your PC

The latest version of the AEMTuner software can be downloaded from the AEMTuner section of the AEM Performance Electronics forums. Series 2 units are not supported by the older AEMPro tuning software.

2) Change Cam/Crank Angle Sensor: AEM trigger disc MUST be used

On Nissans, discrepancies have been observed in the OEM cam/crank angle signals between model years and/or trim levels. To avoid confusion the Series 2 EMS does not support the OEM Nissan trigger pattern. A replacement trigger disc is now included with every Nissan EMS and must be installed before attempting to start the engine. An AEM trigger disc is supplied with each 30-6601 EMS which fits SR20DET cam angle sensors. Please consult the following instructions supplement, which will be installed to the C:\Program Files\AEM\AEMTuner\Instructions folder:

'10-6600-C for EMS - 30-66XX supplement- CAS trigger install KA, GA, and SR engines.PDF'

3) Remove the Stock Engine Control Unit

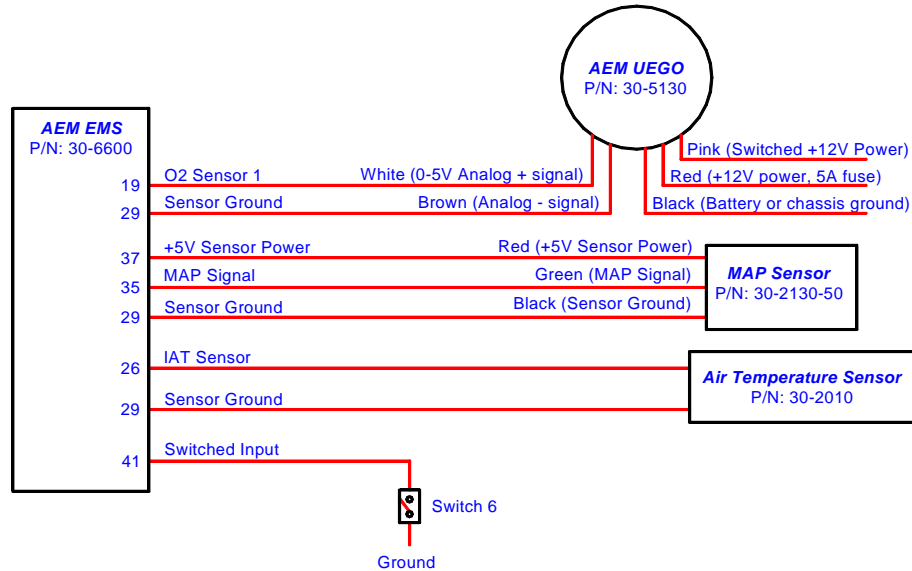
- a) Access the stock Engine Control Unit (ECU). The location of the ECU on the 180SX, Silvia, and 240SX vehicles is behind the kick-panel on the passenger side of the vehicle.
- b) Carefully disconnect the wiring harness from the ECU. Avoid excessive stress or pulling on the wires, as this may damage the wiring harness. Some factory ECUs 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 them aside. Do not destroy or discard the factory ECU, as it can be reinstalled easily for street use and troubleshooting.

4) Install the AEM Engine Management System

- a) Plug the factory wiring harness into the AEM EMS and position it so the wires are not pulled tight or stressed in any manner. Secure the EMS with the provided Velcro fasteners.
- b) Plug the comms cable into the EMS and into your PC.
- c) Turn the ignition on, but do not attempt to start the engine.
- d) At the time these instructions were written, new EMS units do not require USB drivers to be installed to the PC.
- e) With the AEMTuner software open, select **ECU>>Upload Calibration** to upload the startup calibration file (.cal) that most closely matches the vehicle's configuration to be tuned. Check the Notes section of the calibration for more info about the vehicle it was configured for. These files can be found in the following folder:
C:\Program Files\AEM\AEMTuner\Calibrations\Nissan
- f) Set the throttle range: Select Wizards>>Set Throttle Range and follow the on-screen instructions. When finished, check that the 'Throttle' channel never indicates less than 0.2% or greater than 99.0%, this is considered a sensor error and may cause some functions including idle feedback and acceleration fuel to operate incorrectly.

5) Wiring accessories to the EMS:

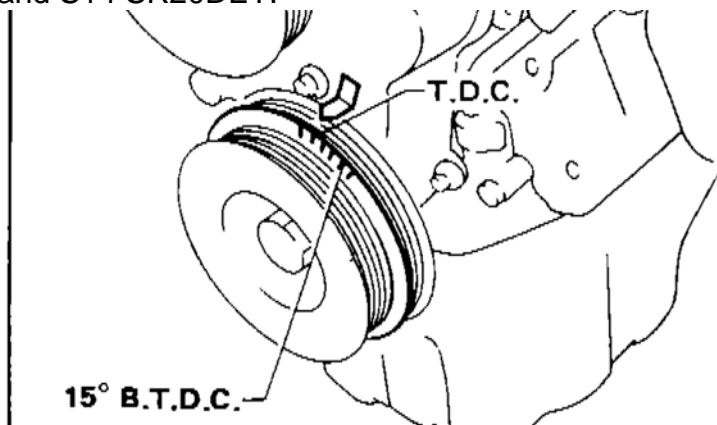
Please follow this suggested wiring diagram when adding accessories such as UEGO gauges, MAP sensors, IAT sensors, or switches for use with the EMS. Note that wire polarity is not important for the Air Temperature sensor.



6) Ready to begin tuning the vehicle.

- a) Before starting the engine, verify that the fuel pump runs for a couple of seconds when the key is turned on and there is sufficient pressure at the fuel rail. If a MAP sensor is installed, check that the Engine Load indicates something near atmospheric pressure (approximately 101kPa or 0 PSI at sea level) with the key on and engine off. Press the throttle and verify that the 'Throttle' channel responds but the Engine Load channel continues to measure atmospheric pressure correctly.
- b) Start the engine and make whatever adjustments may be needed to sustain a safe and reasonably smooth idle. Verify the ignition timing: Select **Wizards>>Ignition Timing Sync** from the pull-down menu. Click the 'Lock Ignition Timing' checkbox and set the timing to a safe and convenient value (for instance, 10 degrees BTDC). Use a timing light and compare the physical timing numbers to the timing value you selected. Use the *Sync Adjustment Increase/Decrease* buttons to make the physical reading match the timing number you selected.

Crankshaft timing marks are not labeled for some vehicles. Consult the factory service manual for more information. The diagram below shows labels for the S13 and S14 SR20DET:



- c) Note: This calibration needs to be properly tuned before driving the vehicle. It is intended for racing vehicles and may not operate smoothly at idle or part-throttle.
NEVER TUNE THE VEHICLE WHILE DRIVING

7) Troubleshooting an engine that will not start

- a) Double-check all the basics first... engines need air, fuel, compression, and a correctly-timed spark event. If any of these are lacking, we suggest checking simple things first. Depending on the symptoms, it may be best to inspect fuses, sufficient battery voltage, properly mated wiring connectors, spark using a timing light or by removing the spark plug, wiring continuity tests, measure ECU pinout voltages, replace recently-added or untested components with known-good spares. Check that all EMS sensor inputs measure realistic temperature and/or pressure values.
- b) If the EMS is not firing the coils or injectors at all, open the Start tab and look for the 'Stat Sync'd' channel to turn ON when cranking. This indicates that the EMS has detected the expected cam and crank signals; if Stat Sync'd does not turn on, monitor the Crank Tooth Period and T2PER channels which indicate the time between pulses on the Crank and T2 (Cam) signals. Both of these channels should respond when the engine is cranking, if either signal is not being detected or measuring an incorrect number of pulses per engine cycle the EMS will not fire the coils or injectors.
- c) If the Engine Load changes when the throttle is pressed this usually indicates that there is a problem with the MAP sensor wiring or software calibration (when the EMS detects that the MAP Volts are above or below the min/max limits it will run in a failsafe mode using the TPS-to-Load table to generate an artificial Engine Load signal using the Throttle input). This may allow the engine to sputter or start but not continue running properly.

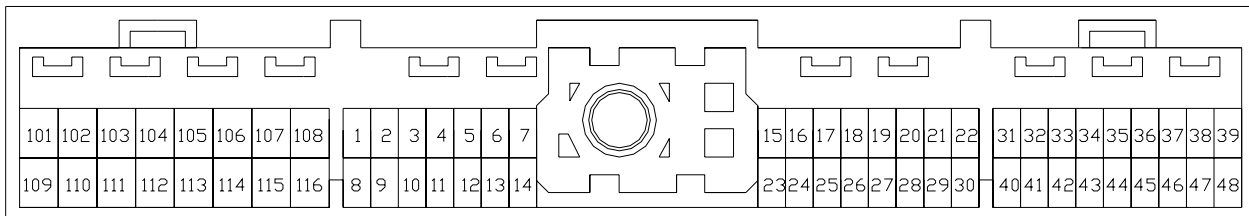
Application Notes for EMS P/N 30-6601

1991-1993 Silvia S13 SR20DET, 1991-1995 180SX SR20DET

Make:	Nissan
Model:	Silvia and 180SX
Years Covered:	1991-1995
Engine Displacement:	2.0L
Engine Configuration:	Inline 4
Firing Order:	1-3-4-2
N/A, S/C or T/C:	Turbocharged
Load Sensor Type:	0-5V MAF
# Coils:	4
Ignition driver type:	0-5V Falling Edge trigger
Number of Injectors:	4 (P&H drivers: Inj 1-4)
Factory Injectors:	370cc Saturated
Factory Inj Resistors:	No
Injection Mode:	Sequential
Knock Sensors used:	1
Lambda Sensors used:	1
Idle Motor Type:	Duty-controlled solenoid
Main Relay Control:	Yes (not user programmable)
Crank Pickup Type:	Optical
**Crank Teeth/Cycle:	24 (AEM trigger disc)
Cam Pickup Type:	Optical
**Cam Teeth/Cycle:	1 (AEM trigger disc)
Transmissions Offered:	Manual/Automatic
Trans Supported:	Manual
Drive Options:	RWD
Supplied Connectors:	N/A
AEM extension/patch harness	30-2995

Spare Injector Drivers:	Inj 5, Pin 23
Spare Injector Drivers:	Inj 6, Pin 105
Spare Injector Drivers:	Inj 7, Pin 14
Spare Injector Drivers:	Inj 8, Pin 114
Boost Solenoid:	PW 2, Pin 111
EGT 1 Location:	Pin 5
EGT 2 Location:	Pin 15
EGT 3 Location:	Pin 44
EGT 4 Location:	Pin 115
Spare 0-5V Channels:	MAP, Pin 35
Spare 0-5V Channels:	ADCR11, Pin 33
Spare Low Side Driver:	LS2, Pin 45
Spare Low Side Driver:	LS4, Pin 102
Spare Low Side Driver:	LS5, Pin 10
Spare Low Side Driver:	LS6, Pin 11
Check Engine Light:	LS10, Pin 24
Spare High Side Driver:	HS1, Pin 28
Spare Switch Input:	Switch 2, Pin 43
A/C Switch Input:	Switch 6, Pin 41

Wire View of AEM EMS



WARNING:

*All switch input pins must connect to ground; the switch should not provide 12V power to the EMS because that will not be detected as on or off.

The function of several pins have been changed from the original 30-1601 EMS, please see the pinout chart for more info.

Engine Wiring Harnesses, 'swapped' engine installations

Many Nissan wiring harnesses have been found to contain significant differences between model years and/or trim levels. Likely differences include: Crank signal, Cam signal, Ignition switch wiring (the Ignition switch input controls the Main Relay output), injector and coil destinations. Official documentation for some vehicles was not offered in English, so it would be very wise to double-check the pinout destinations for these circuits. This is especially true if the vehicle contains a 'swapped' engine or if the wiring harness has been cut, spliced, soldered, tapped or modified in any manner. It is the user's responsibility to check that the wiring on the vehicle matches the pinout chart below. AEM will not be held responsible for loss or damage that can occur if the EMS is installed in a vehicle in which the wiring harness does not match the AEM-supplied pinout chart!

Primary Load Sensor, EMS Fuel Strategy

The factory MAF (mass air flow) sensor(s) can be removed to help decrease intake air restriction; the EMS can be configured to use a MAP sensor to determine engine load. It is recommended to use a 3.5 bar MAP sensor or higher (P/N 30-2130-50).

The factory Mass Air Flow sensor can be used as the primary load input for the AEM EMS if desired. Please check the Notes section of each calibration for more info about the vehicle setup and fuel strategy that calibration was configured to use.

EMS Fuel Map, Boost Fuel Trim Table

The 30-6601 maps provided utilize the "*Boost Fuel Trim Table*" to provide a 1:1 fuel compensation above and below atmospheric pressure. In the startup calibration, the "*Boost Fuel Trim Table*" is configured to provide twice as much fuel when the manifold pressure is twice as high and half the fuel when the manifold pressure is half as high; this should help simplify the tuning process for different vacuum and boost levels. Notice the values in the main "*Fuel Map*" do not change above 100 kPa (0 psi boost), the fuel correction is being made by the "*Boost Fuel Trim Table*."

Note: the "*Boost Fuel Trim Table*" must be adjusted if a different MAP sensor is installed or if the Load breakpoints are adjusted. The Boost Fuel Trim value should be set to -90 at 10kPa, 0 at 100 kPa, +100 at 200 kPa, +200 at 300 kPa, etc...

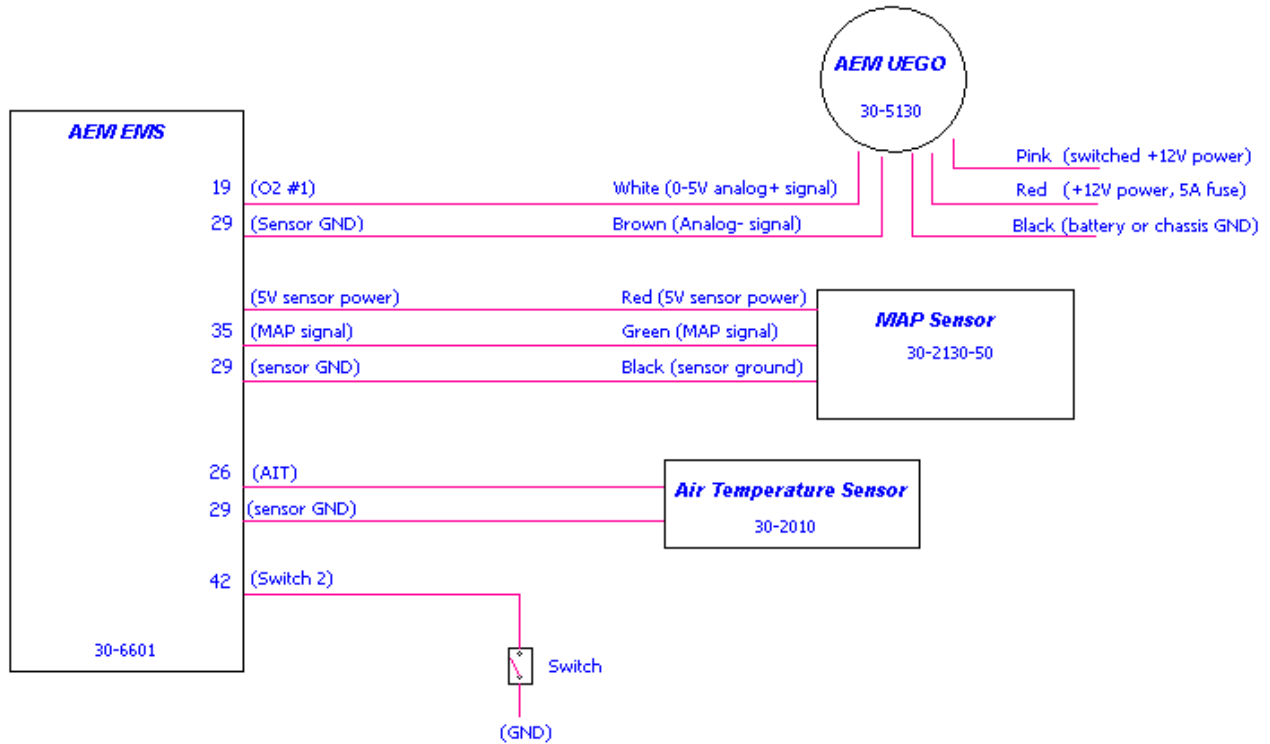
Peak and Hold Injector Drivers

Injectors 1-6 include Peak (4 amps) and Hold (1 amp) injector drivers. These drivers may be used with peak and hold or saturated type injectors. The factory Nissan wiring harness may contain a resistor pack to prevent excessive current when using low-impedance injectors with the stock ECU. With the 30-6601 installed, users can elect to remove and bypass the OEM resistor pack for more precise control of low-impedance injectors.

Please note that the injector response time will be different with and without the factory injector resistor pack. If the OEM resistor pack has been removed and bypassed, please use the correct battery offset wizard for your injectors. Most battery offset wizards will specify <P&H DRIVER> if they are intended for use without a resistor pack.

Wiring accessories to the EMS:

Please follow this suggested wiring diagram when adding accessories such as UEGO gauges, MAP sensors, IAT sensors, or switches for use with the EMS. Note that wire polarity is not important for the Air Temperature sensor.

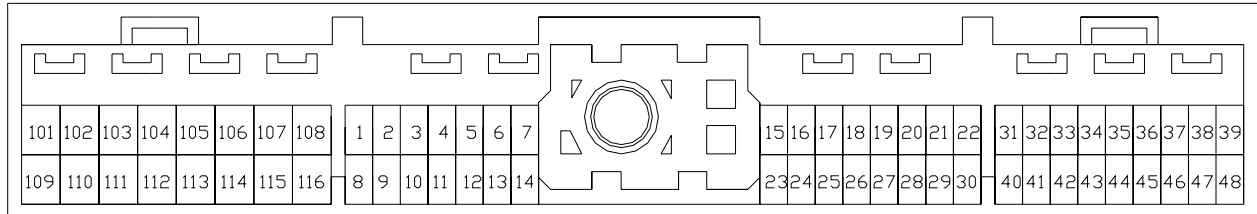


Connection Diagram for EMS P/N 30-6601

PnP	These pins are used in the AEM-supplied startup calibration. They can be reconfigured by the end user.
Available	Not used by the startup calibration. Modifications to the OEM wiring may be required before use.
Dedicated	The function of these pins is fixed and must not be changed.

Pin	1991-1995 Nissan 180SX SR20DET, 1991-1993 Nissan Silvia S13 SR20DET	AEM EMS 30-6601	I/O	Notes
1	Ignition 1	Coil 1	Output	PnP for Coil 1, 0-5V Falling Edge trigger
2	Ignition 2	Coil 2	Output	PnP for Coil 2, 0-5V Falling Edge trigger, connects to pin 7
3	Tachometer Signal	Low Side 7	Output	PnP for Tachometer
4	ECCS Self-Shutoff Relay	Main Relay (control)	Output	Dedicated, EMS activates relay with switched GND
5	Ignition pulse monitor	EGT 1	Input	Available, jumper set for 0-5V Input
6	ECCS Ground	Power Ground	Input	Dedicated
7	Data Link Connector	Coil 2	Output	PnP for Coil 2, 0-5V Falling Edge trigger, connects to pin 2
8	Ignition 3	Coil 3	Output	PnP for Coil 3
9	Ignition 4	Coil 4	Output	PnP for Coil 4
10	---	Low Side 5	Output	Available, Switched Ground, 1.5A max
11	---	Low Side 6	Output	Available, Switched Ground, 1.5A max
12	A/T Signal No. 3	CAN1H	Output	Dedicated, CAN high side
13	ECCS Ground	Power Ground	Input	Dedicated
14	Diagnostics Clock	Injector 7	Output	Available, Switched Ground, 1.5A Max

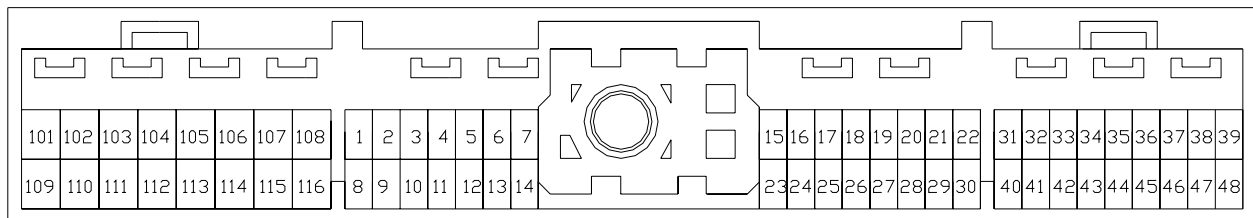
Wire View of AEM EMS



Connection Diagram for EMS P/N 30-6601

Pin	1991-1995 Nissan 180SX SR20DET, 1991-1993 Nissan Silvia S13 SR20DET	AEM EMS 30-6601	I/O	Notes
15	Data Link Connector	EGT 2	Input	Available, jumper set for 0-5V Input
16	Mass Air Flow Sensor	MAF	Input	PnP for MAF Sensor
17	Mass Air Flow Ground	Power Ground	Input	Dedicated
18	ECT Sensor	Coolant	Input	PnP for Coolant Temp Sensor
19	Oxygen Sensor	O2 #1	Input	Dedicated, 0-5V input signal
20	Throttle Position Sensor	TPS	Input	PnP for Throttle Position Sensor
21	Sensor Ground	Sensor Ground	Output	Dedicated, sensors only
22	Crankshaft Reference Signal	Cam (T2)	Input	Dedicated, must use AEM replacement trigger disc.
23	Data Link Connector	Injector 5	Output	Available, Switched Ground, 1.5A Max
24	Malfunction Indicator Light	Low Side 10	Output	Available, Switched Ground, 1.5A Max
25	Exhaust Over Temp Warning Lamp	Low Side 3	Output	Available, Switched Ground, 1.5A Max
26	Exhaust Temperature sensor	AIT	Input	Available, Air Intake Temperature Sensor Input, (2.2k pull-up resistor to 5V)
27	Knock Sensor	Knock 1	Input	PnP for Knock Sensor
28	A/T Signal No. 4	High Side 1	Output	Available, Switched +12V, 1.5A Max
29	Sensor Ground	Sensor Ground	Output	Dedicated, sensors only
30	Crankshaft Reference Signal	Cam (T2)	Input	Dedicated, must use AEM replacement trigger disc.

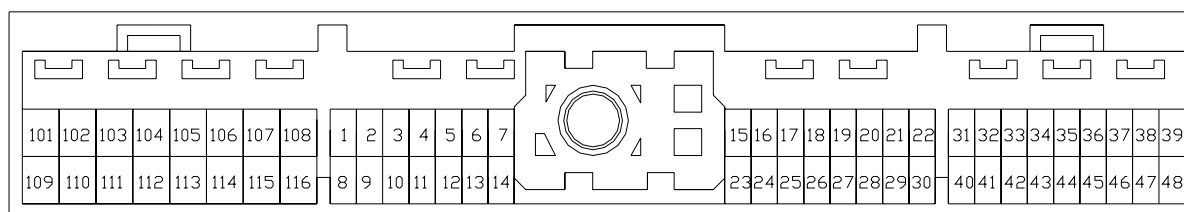
Wire View of AEM EMS



Connection Diagram for EMS P/N 30-6601

Pin	1991-1995 Nissan 180SX SR20DET, 1991-1993 Nissan Silvia S13 SR20DET	AEM EMS 30-6601	I/O	Notes
31	Crankshaft Position Sensor Signal	Crank Signal	Input	Dedicated, must use AEM replacement trigger disc Connects to pin 40
32	Vehicle Speed	T3	Input	PnP for Vehicle Speed Sensor
33	---	ADCR11	Input	Available, 0-5 Volt Input
34	Start Signal	+12V Switched	Input	Dedicated
35	Neutral Position Switch	MAP	Input	Available, Manifold Pressure sensor input
36	Ignition Switch	Main Relay (input)	Input	Dedicated, +12V activates Main Relay circuit
37	Throttle Position Sensor Power	+5V Sensor	Output	Dedicated
38	Power Supply for ECM	+12V Switched	Input	Dedicated, gets +12V power when ECCS Relay is on
39	ECCS Ground	Power Ground	Input	Dedicated
40	Crankshaft Position Signal	Crank Signal	Input	Dedicated, must use AEM replacement trigger disc Connects to pin 31
41	Air Conditioner Switch	Switch 6	Input	PnP for A/C Switch
42	A/T Signal No. 1	CAN1L	Input	Dedicated, CAN low side
43	Power Steering Oil Pressure Switch	Switch 2	Input	Available, Switched Input
44	A/T Signal No. 2	EGT 3	Input	Available, jumper set for 0-5V Input
45	A/C FICD	Low Side 2	Output	Available, Switched Ground, 1.5A Max
46	Back-up Power Supply	Permanent +12V	Input	Dedicated, used to store internal log data
47	Power Supply for ECM	+12V Switched	Input	Dedicated, gets +12V power when ECCS Relay is on
48	ECCS Ground	Power Ground	Input	Dedicated
101	Injector 1	Injector 1	Output	PnP for Injector 1 (Peak & Hold 4A/1A driver)
102	Pulse Secondary Air Injection Solenoid Valve	Low Side 4	Output	Available, Switched Ground, 1.5A max
103	Injector 3	Injector 3	Output	PnP for Injector 3 (Peak & Hold 4A/1A driver)
104	Fuel Pump Relay	Low Side 11	Output	PnP for Fuel Pump relay control signal
105	Fuel Pressure Control Module	Injector 6	Output	Available, Switched Ground, 1.5A max
106	Air Conditioner Relay	Low Side 9	Output	PnP for A/C Compressor
107	ECCS Ground	Power Ground	Input	Dedicated
108	ECCS Ground	Power Ground	Input	Dedicated
109	Reverse Electrical Flow Return Circuit	Permanent +12V	Input	Dedicated
110	Injector 2	Injector 2	Output	PnP for Injector 2 (Peak & Hold 4A/1A driver)
111	Turbo Boost Pressure Control Solenoid	PW 2	Output	Available, Pulse Width Out
112	Injector 4	Injector 4	Output	PnP for Injector 4 (Peak & Hold 4A/1A driver)
113	Idle Auxiliary Air Control Valve	PW 1	Output	PnP for Idle Air Control
114	---	Injector 8	Output	Available, Switched Ground, 1.5A max
115	---	EGT 4	Input	Available, jumper set for 0-5V Input
116	ECCS Ground	Power Ground	Input	Dedicated

Wire View of AEM EMS



30-1601 (Series 1) vs 30-6601 (Series 2) EMS differences:

The EMS functions assigned to certain pins have been changed and no longer match the 30-1601 EMS. Unless otherwise noted, the following pins and functions will need to be manually reconfigured after using AEMTuner to convert a V1.19 (30-1601, Series 1 EMS) calibration for use with the 30-6601 Series 2 hardware.

Pin	Vehicle harness destination	30-1601 function	30-6601 function	Notes
12	A/T Signal No. 3	Low Side 5	CAN1H	LS5 not available
15	Data Link Connector	Injector 8	EGT 2	Injector 8 available on pin 114
42	A/T Signal No. 1	Switch 1	CAN1L	Switch 1 not available
114	---	EGT 2	Injector 8	EGT 2 available on pin 15

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 \$75.00 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.