

e-Stroke Technical Manual

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Section 1.0: e-Stroke Overview

Verifying proper brake setup on commercial air-braked vehicles has historically been a significant problem in our industry. While daily **Stationary** brake inspections are required, they are seldom performed due to the time and difficulty required with current brake system designs. Also, out of adjustment brakes continue to be one of the top out of service violations noted at road-side inspections.

Based on this need, MGM developed and launched in 2000 an electronic brake monitoring system called e-STROKE. e-Stroke utilizes a sensor mounted inside the brake chambers to measure actual brake stroke and convey this information to an electronic control unit for analysis. The system can be utilized to automatically conduct **Stationary** brake inspections, as well as provide continuous brake monitoring.

MGM first launched the GEN 1 e-Stroke system in 2000. This system used an ECU (otherwise known as a Chassis Communication Module or CCM) to display real-time brake status via LED's on the front of the CCM. The product then evolved into the GEN 2 system in 2005 which incorporated some new features such as brake pressure sensing, vehicle speed monitoring, and J1708 / J1587 support.

Now the product has evolved into our GEN 3 system which adds new features such as fault code storage and retrieval, brake application pressure monitoring and transmission, real-time road speed, additional wheel end support, lining wear monitoring, J-1939 support, and advanced diagnostics.

This manual covers all three product evolutions, but is mainly dedicated to the GEN 3 product. Throughout this manual you will see the various product generations noted and explained in detail.

e-Stroke³ (GEN III)

The next generation of MGM Brakes e-Stroke[®] System technology is e-S³[™] or GEN 3. This third generation system includes memory capabilities for collecting and utilizing the brake status information, and monitoring brake lining wear. e-S³[™] technology provides the same quick, accurate brake stroke status readings for any air-braked vehicle with exposed push rod brake chambers as did the earlier systems.

Earlier systems utilize LED blink codes on the Chassis Communications Module (CCM) to display brake related faults: i.e. non-functioning, over-stroking and dragging brake; to the operator or service technician. While these “blink codes” provided the information needed to pinpoint the problem, that information was not always readily available to the operator, or technician. The CCM was usually mounted outside the cab or out of the view of the operator, making it difficult to view the fault codes from the operator's position during brake applications and trouble shooting. The e-S³[™] CCM does not include any LEDs to view so it can be mounted in a convenient out of the way location.

As with previous systems, an optional dash mounted “warning light” notifies the operator that a fault has occurred, but unlike those previous systems, additional warning lights are available for lining wear and trailer faults if applicable. This allows the operator or technician to identify the problem area faster than ever before.

Now, because eS³™ tracks application air pressure with every actuation, over-stroke faults can be analyzed to determine if the fault was the result of an actual over-stroke, or was it the result of component deflection due to high application air pressure; an intermittent dragging brake can be identified and addressed before it **becomes** a more serious and costly problem: and, because eS³™ is compatible with most lining wear sensors, lining wear issues can be identified, thus reducing component wear while prolonging the intervals between relining.

The eS³™ System is capable of monitoring brake status and lining wear for up to (4) axles recording brake fault history up to (126) incidences of each fault, per wheel.

Brake fault history, as well as brake lining status, recorded by the eS³™ System can now be displayed in three convenient methods: warning light blink codes, the eDT™ J1708 / J1939 display, and an RS-232 computer based diagnostic program.

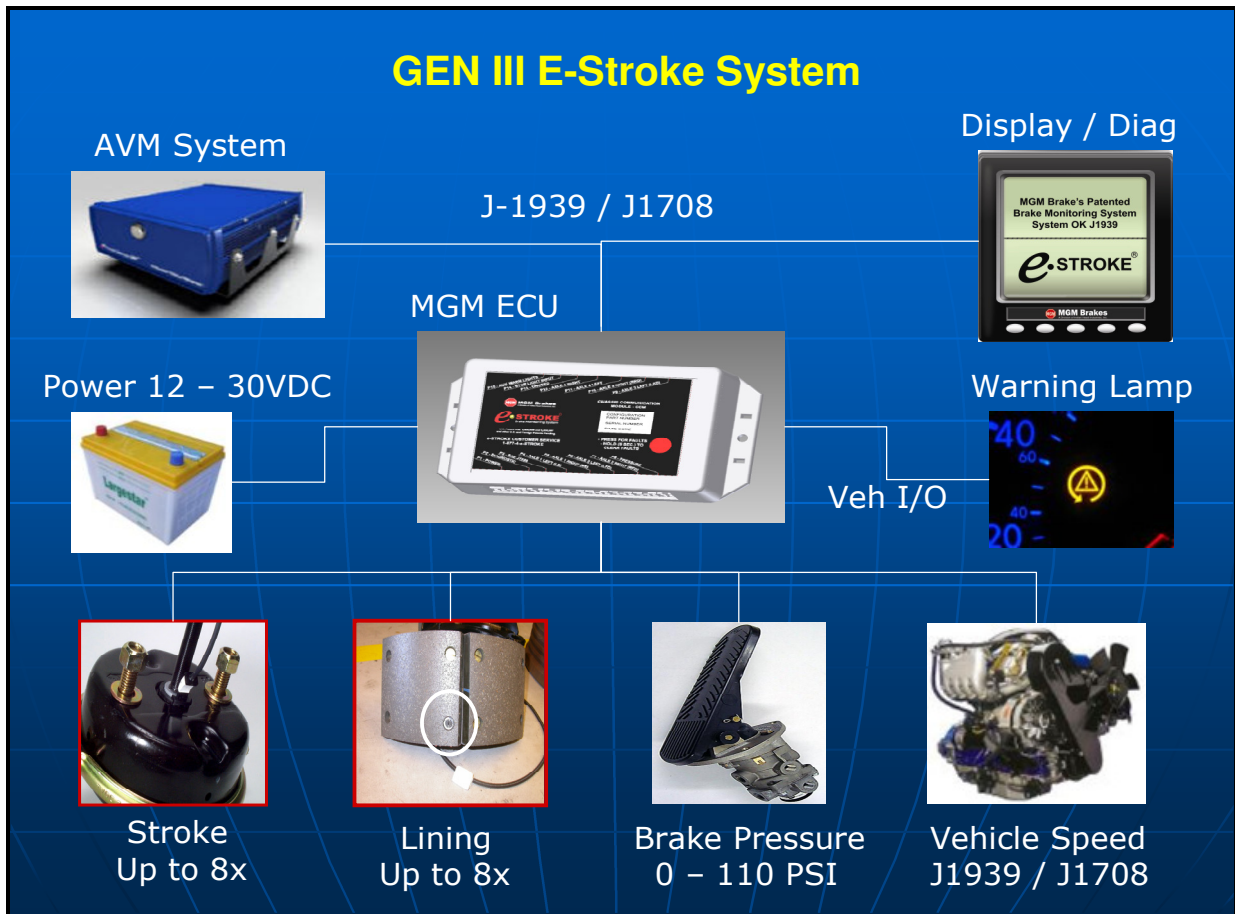
The dash mounted warning lights can be prompted to display blink codes indicating stored brake faults simply by pressing a button on the CCM. After the stored faults are viewed, they can be erased from the CCM by pressing the button again.

eDT™, an e-Stroke handheld diagnostic tool kit, (P/N 9090110), may be used to view the system status for any e-Stroke system connected to either SAE J1708 or J1939 circuits. In addition, the eDT™ can view, and clear fault history, as well as display vehicle speed and brake application pressure in real time, for eS³™ Systems connected to SAE J1939 circuits. Using the eDT™ as a hand held diagnostic tool is as simple as plugging into the vehicle 6 or 9 pin data port connectors with the supplied harness. Once plugged in, the display will automatically link up to the eS³™ CCM and show the current brake status. A series of intuitive menus can be navigated using a few buttons to access all of the brake information available in the CCM. The eDT™ can also be permanently mounted in the cab, where the operator can see the brake status, clearly displayed in real time.

A computer based diagnostic tool kit, (P/N 9090109), is also available for the eS³™ system. The kit includes the diagnostic software on CD and appropriate harnesses for connection from the computers RS-232 plug or USB port to the CCM. This diagnostic software can be easily loaded on a laptop and connected to the eS³™ System where brake status and history can be viewed as well as lining wear status. In addition, the system configuration and serial numbers can be viewed. This kit allows the operator or technician to analyze this information in detail, enhancing the system's usefulness as a prognostic and/or diagnostic tool.

Where available with OEM installations, the eS³™ System can also be monitored via SAE J1939 transmissions to the vehicle's instrument cluster.

e-Stroke System Block Diagram



The above block diagram depicts the MGM e-Stroke system and its components:

- MGM ECU (CCM): Electronic Controller for the system
- MGM Brake Chambers: Includes embedded brake stroke sensor
- Lining Wear Sensors: Wire loop sensor produced by axle manufacturer
- Brake Pressure Sensor: Monitors brake application pressure by operator
- Vehicle Speed (Engine ECU): CCM monitors vehicle speed via J1708 & J1939
- System Power: 10 to 30 VDC system power source (ignition switched)
- Dash Warning Light: E-Stroke system warning light for driver notification
- MGM J1708 / J1939 Display: Dash display and / or Diagnostic Tool
- AVM System: Black Box Recorder such as Clever Devices
- Laptop Diagnostic Program (not shown): Laptop Diagnostics via RS-232

Section 2.0: e-Stroke System Specifications	
System General Specifications: GEN 3 (Tractor / Truck / Bus), GEN 1 (Trailer)	
<i>CCM P/N Prefix: GEN 3 - 8291XXX, GEN 1 & 2 - 8290XXX,</i>	
Operating Temperature	-40C to 85C
Power Requirement	9.5V DC to 30V DC Ignition Switched
Maximum Current Draw	1.5 amps
System Fuse	GEN 3: 5 amps, GEN 1 & 2: 10 amps
Environmental Protection	SAE J1455 Compliant
Electrical Protection	SAE J1455 and SAE J1113 Compliant
System Component Specifications:	
Chassis Communications Module (CCM)	<p>GEN 3 CCM:</p> <ul style="list-style-type: none"> ▪ STR750 Flash Micro Controller ▪ FSK (PLC), JTAG, RS-232, J1708, J1939 interface support ▪ Internal 10 bit A/D, external 12 bit A/D ▪ Extended I/O support (Digital & Analog) ▪ RS-232 and J1939 firmware re-programmable ▪ Configurable from 2 to 8 wheel ends ▪ Truck, Tractor, Bus, Trailer configurations available ▪ Diagnostic interface: RS-232, J1708, J1939 ▪ CCM Exterior Dimensions: Width: 7.39", Height: 4.32", Depth: 1.43" ▪ CCM Mounting Options: (2) ¼" Fasteners, Pre Applied Double Sided Tape <ul style="list-style-type: none"> ▪ GEN 1 Trailer approved for exterior mounting. ▪ GEN 3 approved for interior mounted applications only
Pressure Transducer	<ul style="list-style-type: none"> ▪ GEN 3: 110psi Brake Application Pressure Sensing Capability ▪ Burst Pressure Rating – 1000psi ▪ Pneumatic Connection – ¼" NPT Male ▪ Material – Stainless Steel
Actuator Sensor	<ul style="list-style-type: none"> ▪ One piece environmentally sealed Hall Effect sensor ▪ Packard Metri-Pac 150 type 3-pin connector ▪ 60 inch standard sensor length
Wire Harnesses	<ul style="list-style-type: none"> ▪ Power Harness – 5ft to 30ft ▪ Pressure Transducer Harness – 5ft to 20ft ▪ Sensor Harness – 10ft to 60ft ▪ All exterior cables double insulated with high strength jacket <p><i>Note: Most Harnesses available in 5 ft increments</i></p> <ul style="list-style-type: none"> ▪ Power Harnesses: <ul style="list-style-type: none"> ○ GEN 1 Trailer: Connector Metri-Pack 280 type 4-pin sealed. ○ GEN 3: Molex 5557 series 10 pin non sealed ▪ Sensor assemblies and sensor harnesses: Packard 150 type 3-pin sealed Metri-Pac at sensor end. ▪ See System Schematics for all connection designations.
System Warning Device	<ul style="list-style-type: none"> ▪ Warning Lamp Outputs: Tractor / Truck / Bus Brake Monitor, Lining Wear, Trailer Brake Monitor, Lining Wear ▪ Fault Code Transmission via J1708 & J1939
Brake Actuators	<p>External Piston Rod Brake Actuators are available for a wide range of vehicle applications. It is necessary to select the appropriate actuators for the vehicle application.</p> <ul style="list-style-type: none"> ▪ Consult MGM Brakes Sales (800) 527-1534

Product Compliance

SAE J1455	Environmental testing for Electronic Equipment (Heavy-Duty Trucks)
Section 4.1	Temperature Cycle, Thermal Shock, Thermal Stress
Section 4.2	Humidity
Section 4.3	Salt Spray Atmosphere
Section 4.4	Immersion and Splash (Water Chemicals, and Oils)
Section 4.5	Steam Cleaning and Pressure Washing
Section 4.7	Dust Exposure & Gravel Bombardment
Section 4.9	Mechanical Vibration
Section 4.10	Mechanical Shock
Section 4.11	General Heavy-Duty Truck Electrical Environment – Steady State Electrical Characteristics
SAE J1113/4	Immunity to Radiated Electromagnetic Fields – Bulk Current Injection (BCI) Method
SAE J1113/11	Immunity to Conducted Transients on Power Leads
SAE J1113/12	Electrical Interference by Conduction and Coupling – Coupling Clamp
SAE J1113/13	Immunity to Electrostatic Discharge (ESD)
SAE J1113/21	Immunity to Electromagnetic Fields, 10kHz to 18GHz, Absorber-Lined Chamber (Radiated Susceptibility)
SAE J1113/22	Immunity to Radiated Magnetic Fields from Power Lines
SAE J1113/41	Test Limits and Methods of Measurement of Radio Disturbance Characteristics from Vehicle Components and Modules, Narrowband, 150kHz to 1000 MHz (Conducted & Radiated Emissions)
SAE J1113/42	Conducted Transient Emissions
SAE J1708	Serial Data Communications between Microcomputer Systems in Heavy-Duty Vehicle Applications
SAE J1587	Electronic Data Interchange between Microcomputer Systems in Heavy-Duty Vehicle Applications
SAE J1939	Recommended Practice for a Serial Control Vehicle Communications Network
SAE J1128	Recommended Practices for Vehicle Wiring
UL 94 Fire Rating	UL 94B (Tractor / Truck / Bus CCM Only)