REPORT NUMBER 124-GTL-07-005

SAFETY COMPLIANCE TESTING FOR FMVSS 124 ACCELERATOR CONTROL SYSTEMS

SUZUKI MOTOR CORPORATION
2007 SUZUKI AERIO,
4-DOOR PASSENGER CAR
NHTSA NO. C70503

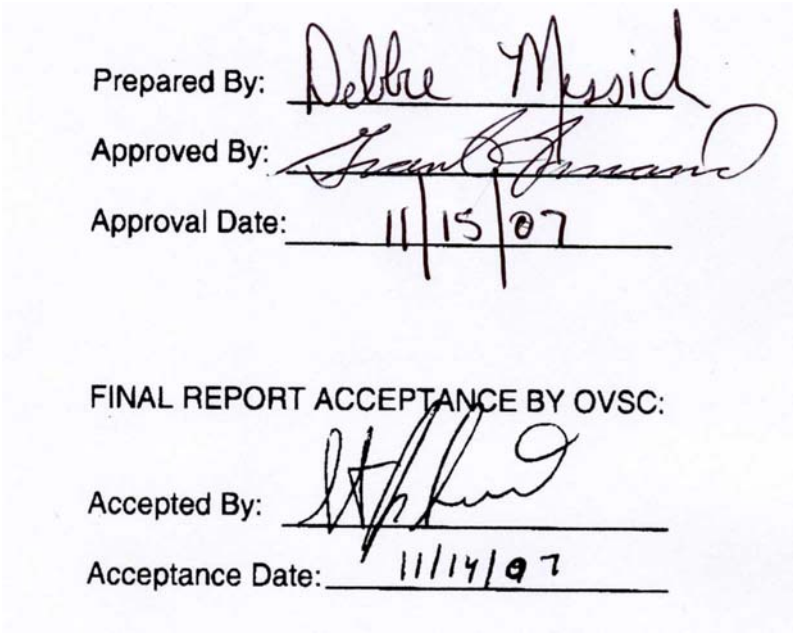
GENERAL TESTING LABORATORIES, INC.
1623 LEEDSTOWN ROAD
COLONIAL BEACH, VIRGINIA 22443

NOVEMBER 15, 2007

FINAL REPORT

PREPARED FOR

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 NEW JERSEY AVE, SE
WASHINGTON, D.C. 20590



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16. Abstract Compliance tests were conducted on the subject 2007 Suzuki Aerio 4-door Passenger Car in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-124-06 for the determination of FMVSS 124 compliance. Test failures identified were as follows:		
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SECTION 1
PURPOSE OF COMPLIANCE TEST

FMVSS 124 specifies requirements for the return of a vehicle's throttle to the idle position when the driver removes the actuating force from the accelerator control, or in the event of a severance or disconnection in the accelerator control system. The purpose of FMVSS 124 is to reduce the number of deaths and injuries resulting from engine overspeed caused by malfunctions in the accelerator control system. This standard applies to passenger cars, multipurpose passenger vehicles (MPV's), trucks and buses.

SECTION 2
TEST PROCEDURES AND DISCUSSION OF RESULTS

Compliance testing was conducted on a 2007 Suzuki Aerio Passenger Car, NHTSA No. C70503 in accordance with the National Highway Traffic Safety Administration (NHTSA) Laboratory Procedure TP-124-06.

Output from the vehicle throttle position sensor on the air throttle plate shaft was used to measure throttle position and data was recorded at 100 HZ with GTL' s data acquisition system. Testing was conducted to simulate the normal removal of the driver's foot from the accelerator pedal. This was performed by depressing the accelerator with a gloved hand which incorporated an electrical contact strip in the depressing forefinger. The accelerator was depressed to the required amount and then the forefinger was quickly removed from the pedal, releasing the accelerator and activating the contact strip for time zero. Testing was performed with the vehicle in park and the engine running. Return to idle times were determined for four throttle plate positions with the accelerator control system complete and with each of the two throttle return springs on the throttle plate shaft independently disconnected and the accelerator return spring on the accelerator pedal disconnected. The severed linkage test was also performed by disconnecting the throttle cable from the throttle body and replacing the cable with another cable which could be quickly severed to simulate a broken throttle cable. The cable was then activated to the required amount of throttle opening and the cable was severed to simulate cable failure. As the air throttle plate was mechanically linked to the accelerator pedal, no electrical disconnections were required.

This testing was performed at mid ambient temperature of 10º C to 46º C, in accordance with the NHTSA Test Procedure TP-124-06.

SECTION 3
COMPLIANCE TEST DATA

Test data for this test can be found on the following pages. Photographs are found in Section 5 and Test Plots are found in Section 6.

DATA SHEET 1
VEHICLE DESCRIPTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2007 SUZUKI AERIO PASSENGER CAR
VEHICLE NHTSA NO.: C70503
VEHICLE VIN: JS2RA62S675353819
DATE OF TEST: SEPTEMBER 14, 2007
TEST LAB: GENERAL TESTING LABORATORIES
VEHICLE ENGINE TYPE: GAS GVWR: 1690 KG
VEHICLE ENGINE SIZE: 2.3 L 4 CYL.
VEHICLE ACCEL. CONTROL SYSTEM (ACS) (Air or Fuel Throttled): AIR
MAX. BHP ENGINE SPEED: 155 HP @ 5400 RPM
MFR. IDLE RPM: 750 RPM
FUEL METERING DEVICE (Carburetor, fuel injection, etc): FUEL INJECTION

REMARKS:

RECORDED BY: G. FARRAND DATE: 09/14/07

APPROVED BY: D. MESSICK

DATA SHEET 2
NORMAL OPERATION TEST
(fully operational system)

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2007 SUZUKI AERIO PASSENGER CAR
VEHICLE NHTSA NO.: C70503
DATE OF TEST: SEPTEMBER 14, 2007

Check one:

Mid Temp. Test: X Low Temp. Test: High Temp. Test:

SYSTEM CONDITION: COMPLETE (no modifications) Normal Operation

GTL #	ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)	THROTTLE POSITION SENSOR READING	RPM	TEMPERATURE (ºC)		THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)	RETURN TIME TO IDLE (Msec)	PASS/ FAIL
				ENGINE COOLANT	AMBIENT			
5867	25%	29%	750	83	27	17%	40	P
5868	50%	50%	750	83	27	17%	70	P
5869	75%	70%	750	83	27	17%	110	P
5870	100%	100%	750	83	27	17%	190	P

RETURN TIME REQUIREMENTS:

1 second (1000 ms) for vehicles less than 4536 kg.
2 seconds (2000 ms) for vehicles more than 4536 kg.
3 seconds (3000 ms) for vehicles exposed to -18º C or less

PASS X FAIL

REMARKS: None

RECORDED BY: G. FARRAND DATE: 09/14/07

APPROVED BY: D. MESSICK

DATA SHEET 3 (1 of 3)
FAIL-SAFE OPERATION DISCONNECTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2007 SUZUKI AERIO PASSENGER CAR
VEHICLE NHTSA NO.: C70503
DATE OF TEST: SEPTEMBER 14, 2007

Check one:

Mid Temp. Test: X Low Temp. Test: High Temp. Test:

SYSTEM CONDITION: #1 SPRING DISCONNECTED LOCATED ON THROTTLE BUTTERFLY

GTL #	ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)	THROTTLE POSITION SENSOR READING	RPM	TEMPERATURE (ºC)		THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)	RETURN TIME TO IDLE (Msec)	PASS/ FAIL
				ENGINE COOLANT	AMBIENT			
5875	25%	27%	750	83	28	17%	40	P
5876	50%	49%	750	83	28	17%	100	P
5877	75%	69%	750	83	28	17%	80	P
5878	100%	101%	750	83	28	17%	170	P

RETURN TIME REQUIREMENTS:

1 second (1000 ms) for vehicles less than 4536 kg.
2 seconds (2000 ms) for vehicles more than 4536 kg.
3 seconds (3000 ms) for vehicles exposed to -18º C or less

PASS X FAIL

REMARKS: None

RECORDED BY: G. FARRAND DATE: 09/14/07

APPROVED BY: D. MESSICK

DATA SHEET 3 (2 of 3)
FAIL-SAFE OPERATION DISCONNECTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2007 SUZUKI AERIO PASSENGER CAR
VEHICLE NHTSA NO.: C70503
DATE OF TEST: SEPTEMBER 14, 2007

Check one:

Mid Temp. Test: X Low Temp. Test: High Temp. Test:

SYSTEM CONDITION: #2 SPRING DISCONNECTED LOCATED ON THROTTLE BUTTERFLY

GTL #	ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)	THROTTLE POSITION SENSOR READING	RPM	TEMPERATURE (ºC)		THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)	RETURN TIME TO IDLE (Msec)	PASS/ FAIL
				ENGINE COOLANT	AMBIENT			
5879	25%	31%	750	83	28	17%	50	P
5880	50%	47%	750	83	28	17%	110	P
5881	75%	77%	750	83	28	17%	180	P
5882	100%	100%	750	83	28	17%	190	P

RETURN TIME REQUIREMENTS:

1 second (1000 ms) for vehicles less than 4536 kg.
2 seconds (2000 ms) for vehicles more than 4536 kg.
3 seconds (3000 ms) for vehicles exposed to -18º C or less

PASS X FAIL

REMARKS: None

RECORDED BY: G. FARRAND DATE: 09/14/07

APPROVED BY: D. MESSICK

DATA SHEET 3 (2 of 3)
FAIL-SAFE OPERATION DISCONNECTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2007 SUZUKI AERIO PASSENGER CAR
VEHICLE NHTSA NO.: C70503
DATE OF TEST: SEPTEMBER 14, 2007

Check one:

Mid Temp. Test: X Low Temp. Test: High Temp. Test:

SYSTEM CONDITION: #3 SPRING DISCONNECTED LOCATED ON ACCELERATOR PEDAL

GTL #	ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)	THROTTLE POSITION SENSOR READING	RPM	TEMPERATURE (ºC)		THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)	RETURN TIME TO IDLE (Msec)	PASS/ FAIL
				ENGINE COOLANT	AMBIENT			
5871	25%	30%	750	83	27	17%	20	P
5872	50%	59%	750	83	27	17%	60	P
5873	75%	68%	750	83	27	17%	120	P
5874	100%	100%	750	83	27	17%	170	P

RETURN TIME REQUIREMENTS:

1 second (1000 ms) for vehicles less than 4536 kg.
2 seconds (2000 ms) for vehicles more than 4536 kg.
3 seconds (3000 ms) for vehicles exposed to -18º C or less

PASS X FAIL

REMARKS: None

RECORDED BY: G. FARRAND DATE: 09/14/07

APPROVED BY: D. MESSICK

DATA SHEET 4
FAIL-SAFE OPERATION SEVERED

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2007 SUZUKI AERIO PASSENGER CAR
VEHICLE NHTSA NO.: C70503
DATE OF TEST: SEPTEMBER 14, 2007

Check one:

Mid Temp. Test: X Low Temp. Test: High Temp. Test:

	SYSTEM CONDITION: SEVERANCE							
GTL #	ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)	THROTTLE POSITION SENSOR READING	RPM	TEMPERATURE (ºC)		THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)	RETURN TIME TO IDLE (Msec)	PASS/ FAIL
				ENGINE COOLANT	AMBIENT			
5883	25%	30%	750	83	28	17%	30	P
5884	50%	50%	750	83	28	17%	80	P
5885	75%	82%	750	83	28	17%	100	P
5886	100%	100%	750	83	28	17%	110	P

RETURN TIME REQUIREMENTS:

1 second (1000 ms) for vehicles less than 4536 kg.
2 seconds (2000 ms) for vehicles more than 4536 kg.
3 seconds (3000 ms) for vehicles exposed to -18º C or less

PASS X FAIL

REMARKS: None

RECORDED BY: G. FARRAND DATE: 09/14/07

APPROVED BY: D. MESSICK

SECTION 4
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

EQUIPMENT	DESCRIPTION	MODEL/ SERIAL NO.	CAL. DATE	NEXT CAL. DATE
CONTINUOUS RECORDER	OMEGA	CT485	06/07	06/08
ENGINE RECORDING	GTL COMPUTER	CPU1	BEFORE USE	BEFORE USE
ENGINE RECORDING	MONARCH	1444664	08/07	08/08
SOFTWARE	GTL	N/A	BEFORE USE	BEFORE USE
CHAMBER	GTL	N/A	N/A	N/A
EXHAUST DUCT	GTL	N/A	N/A	N/A

SECTION 5
PHOTOGRAPHS

2007 SUZUKI AERIO
NHTSA NO. C70503
FMVSS NO. 124

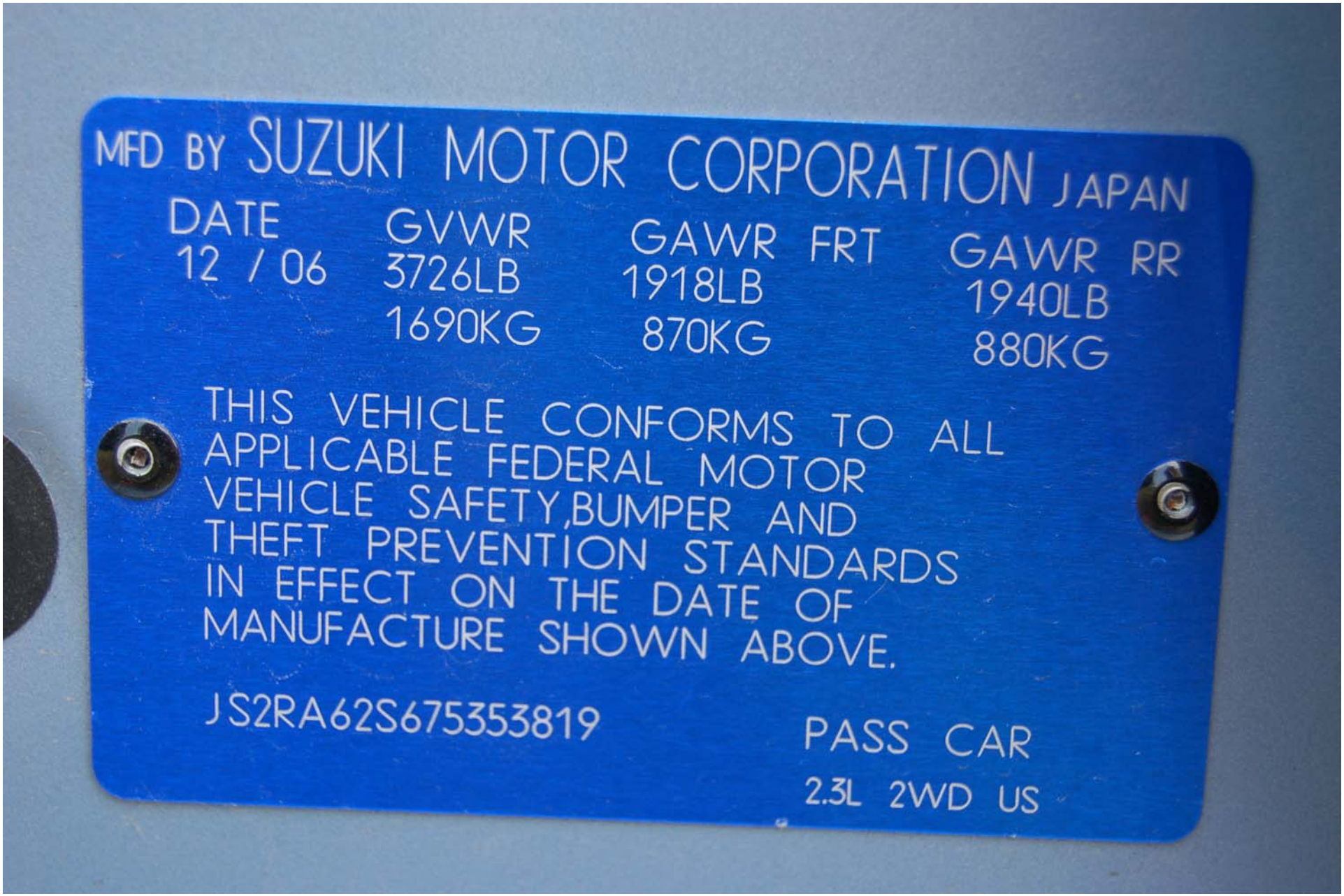
FIGURE 5.1
FRONT VIEW OF VEHICLE

2007 SUZUKI AERIO
NHTSA NO. C70503
FMVSS NO. 124

FIGURE 5.2
LEFT SIDE VIEW OF VEHICLE

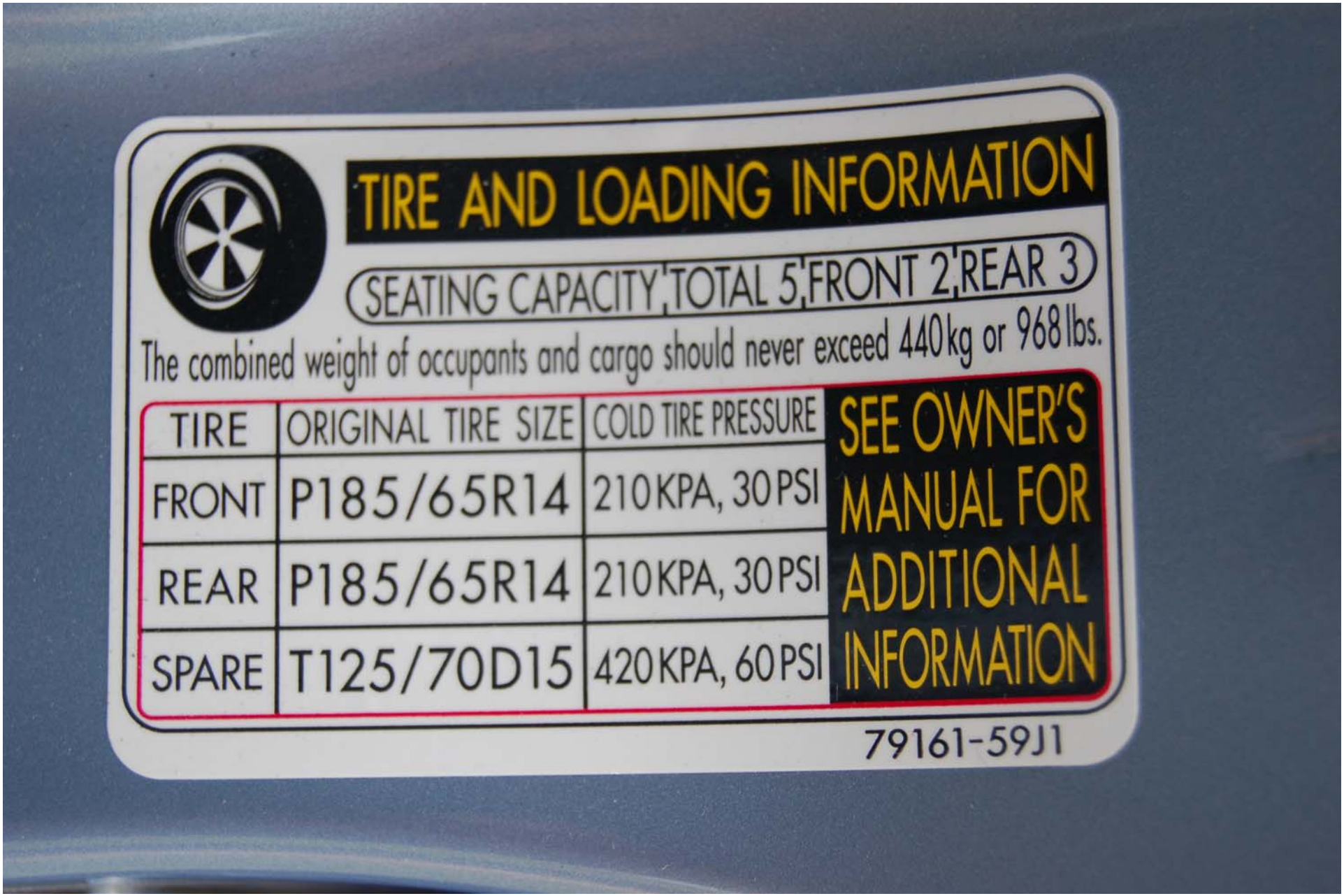
2007 SUZUKI AERIO
NHTSA NO. C70503
FMVSS NO. 124

FIGURE 5.3
RIGHT SIDE VIEW OF VEHICLE



2007 SUZUKI AERIO
NHTSA NO. C70503
FMVSS NO. 124

FIGURE 5.4
CLOSE-UP VIEW OF VEHICLE CERTIFICATION LABEL



2007 SUZUKI AERIO
NHTSA NO. C70503
FMVSS NO. 124

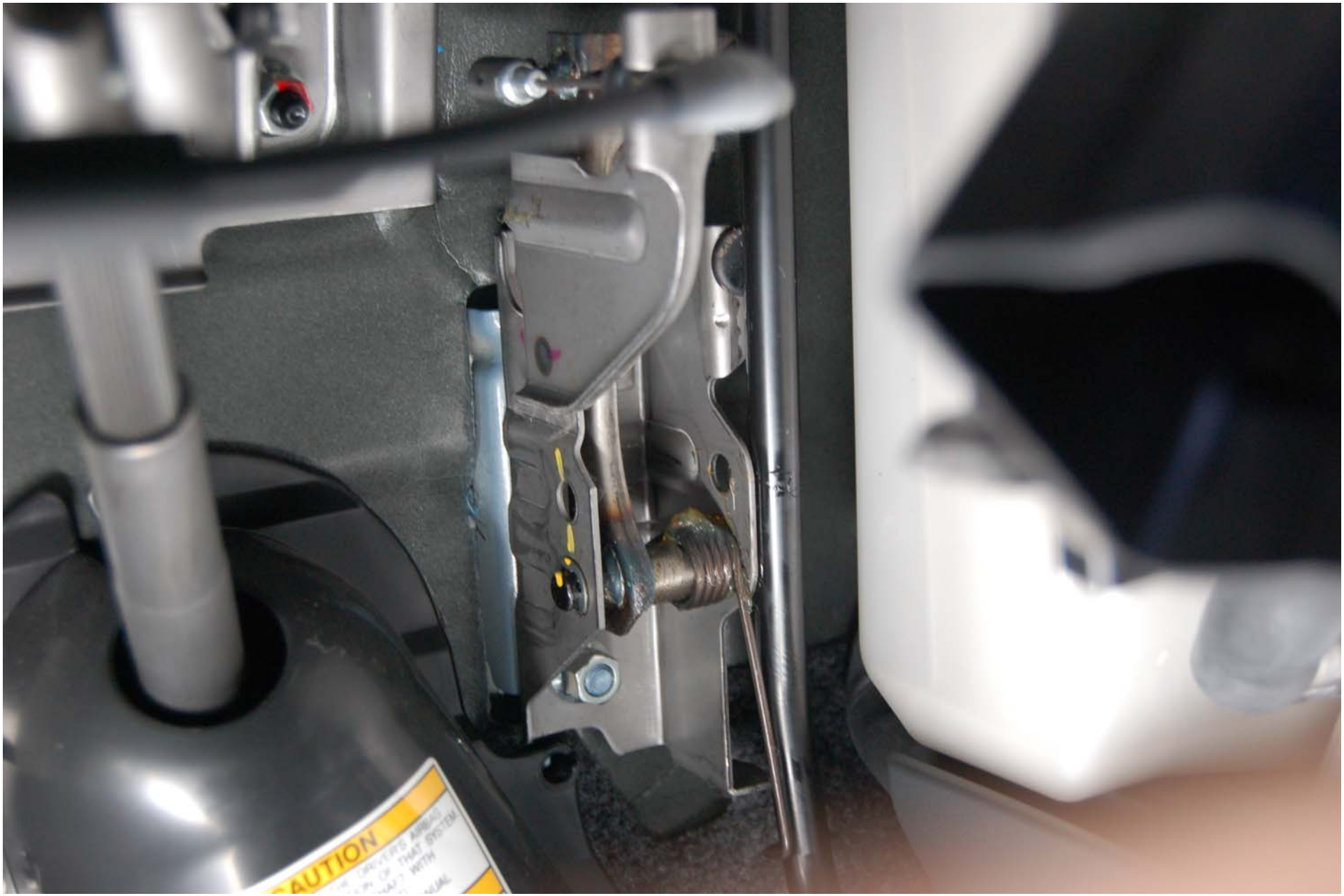
FIGURE 5.5
CLOSE-UP VIEW OF VEHICLE PLACARD

2007 SUZUKI AERIO
NHTSA NO. C70503
FMVSS NO. 124

FIGURE 5.6
ACCELERATOR ASSEMBLY WITH SPRING #3

2007 SUZUKI AERIO
NHTSA NO. C70503
FMVSS NO. 124

FIGURE 5.7
ACCELERATOR TEST SET-UP

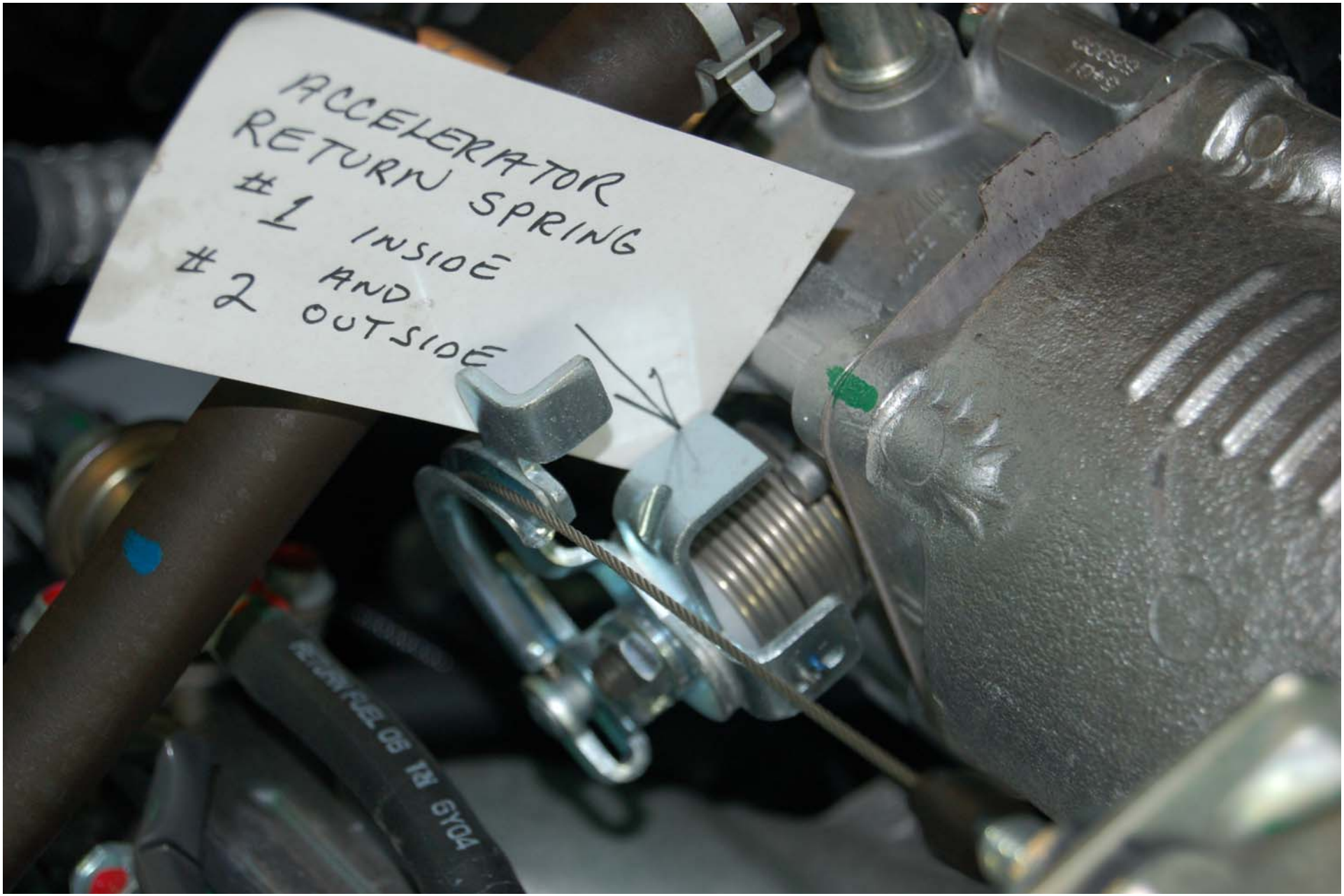


2007 SUZUKI AERIO
NHTSA NO. C70503
FMVSS NO. 124

FIGURE 5.8
ACCELERATOR RETURN SPRING #3

2007 SUZUKI AERIO
NHTSA NO. C70503
FMVSS NO. 124

FIGURE 5.9
THROTTLE BODY ASSEMBLY



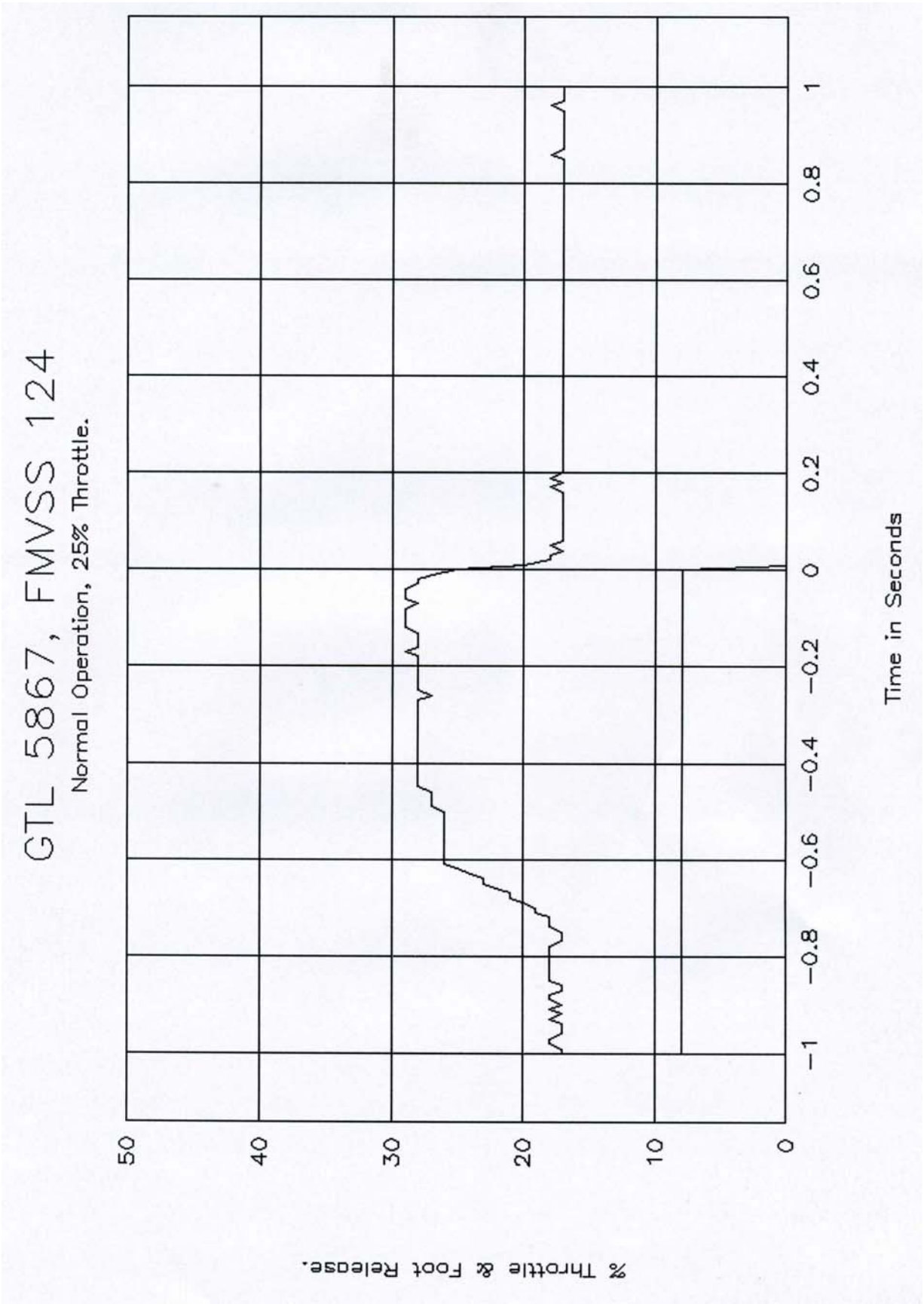
2007 SUZUKI AERIO
NHTSA NO. C70503
FMVSS NO. 124

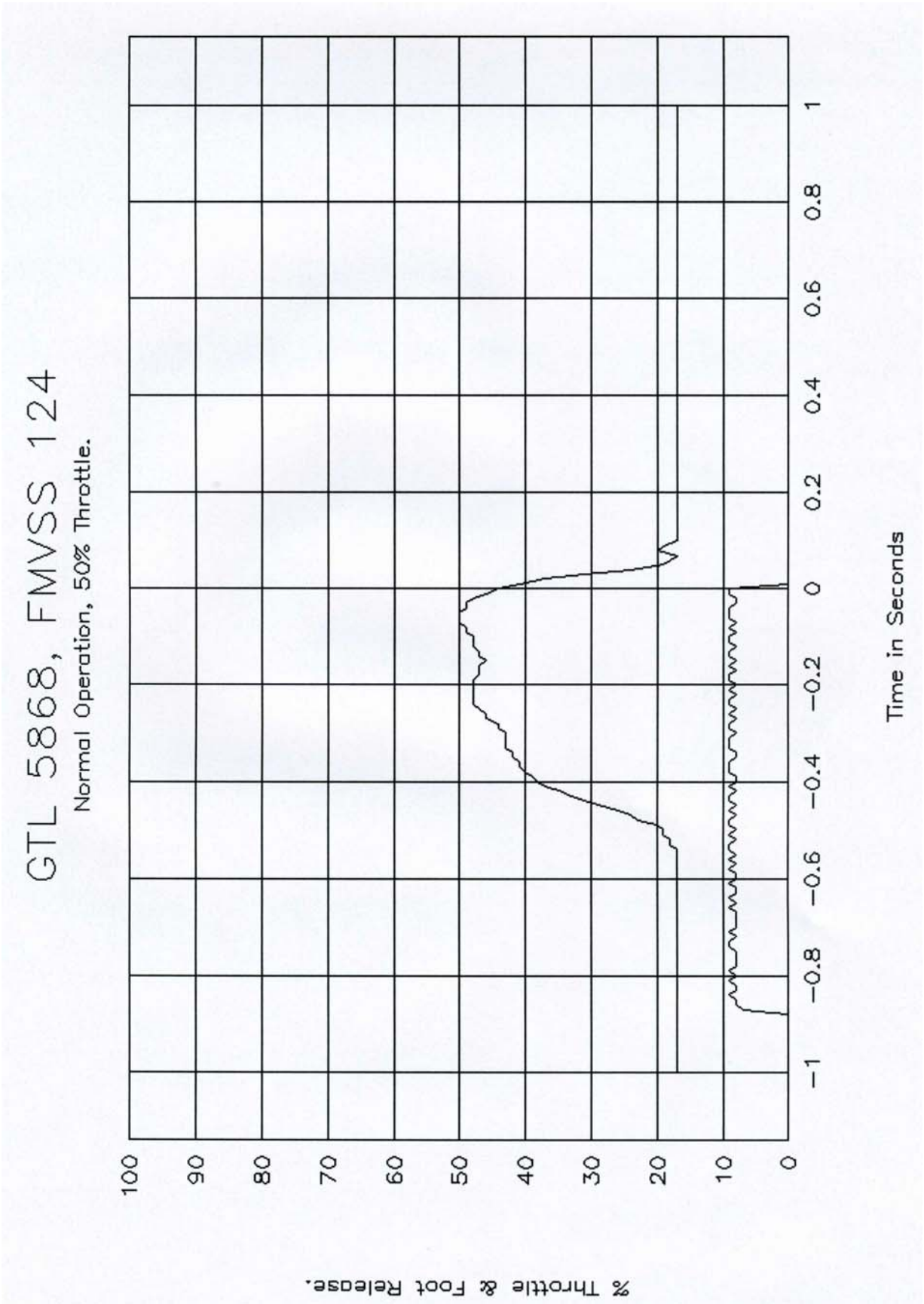
FIGURE 5.10
THROTTLE RETURN SPRINGS #1 AND #2

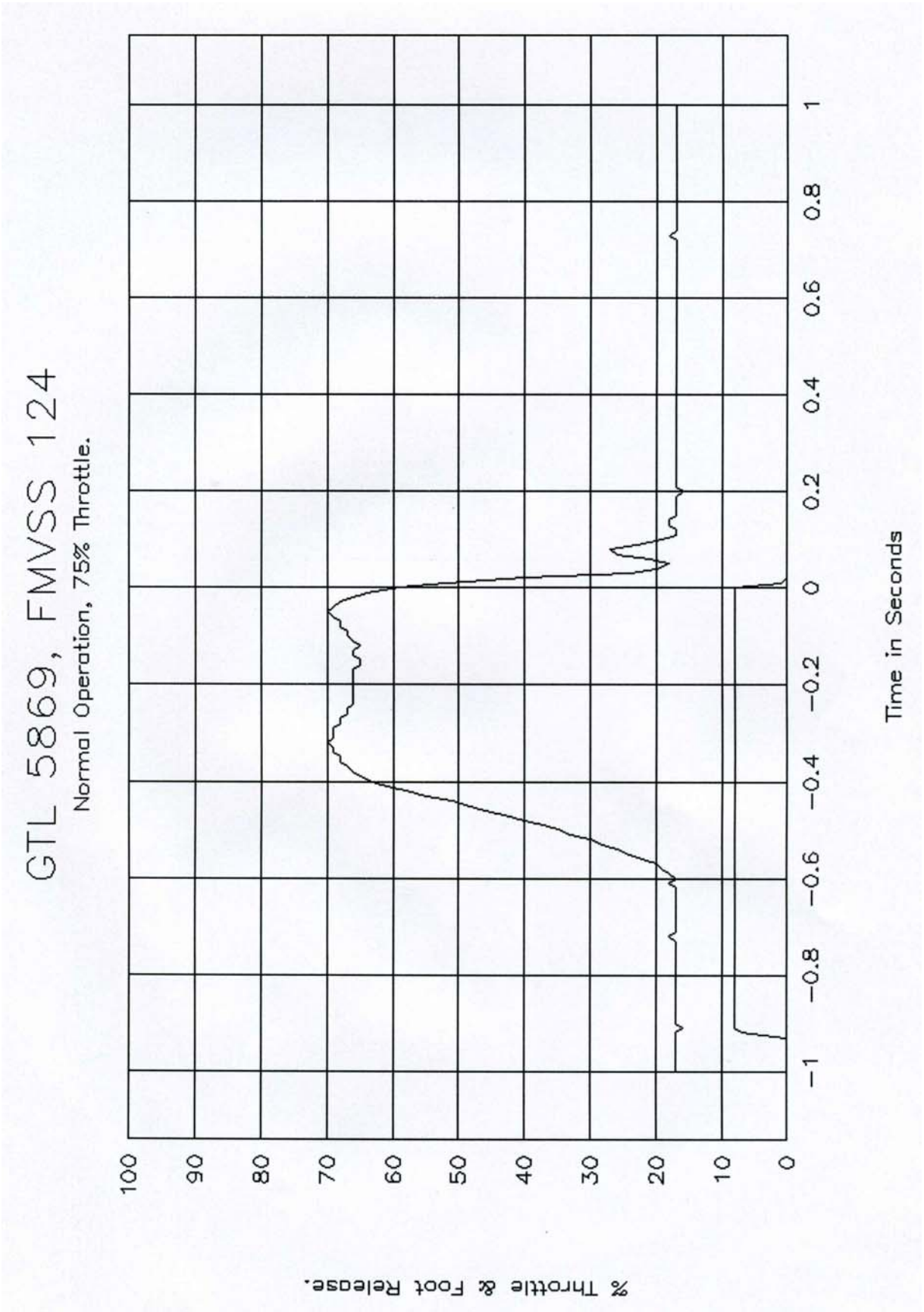
2007 SUZUKI AERIO
NHTSA NO. C70503
FMVSS NO. 124

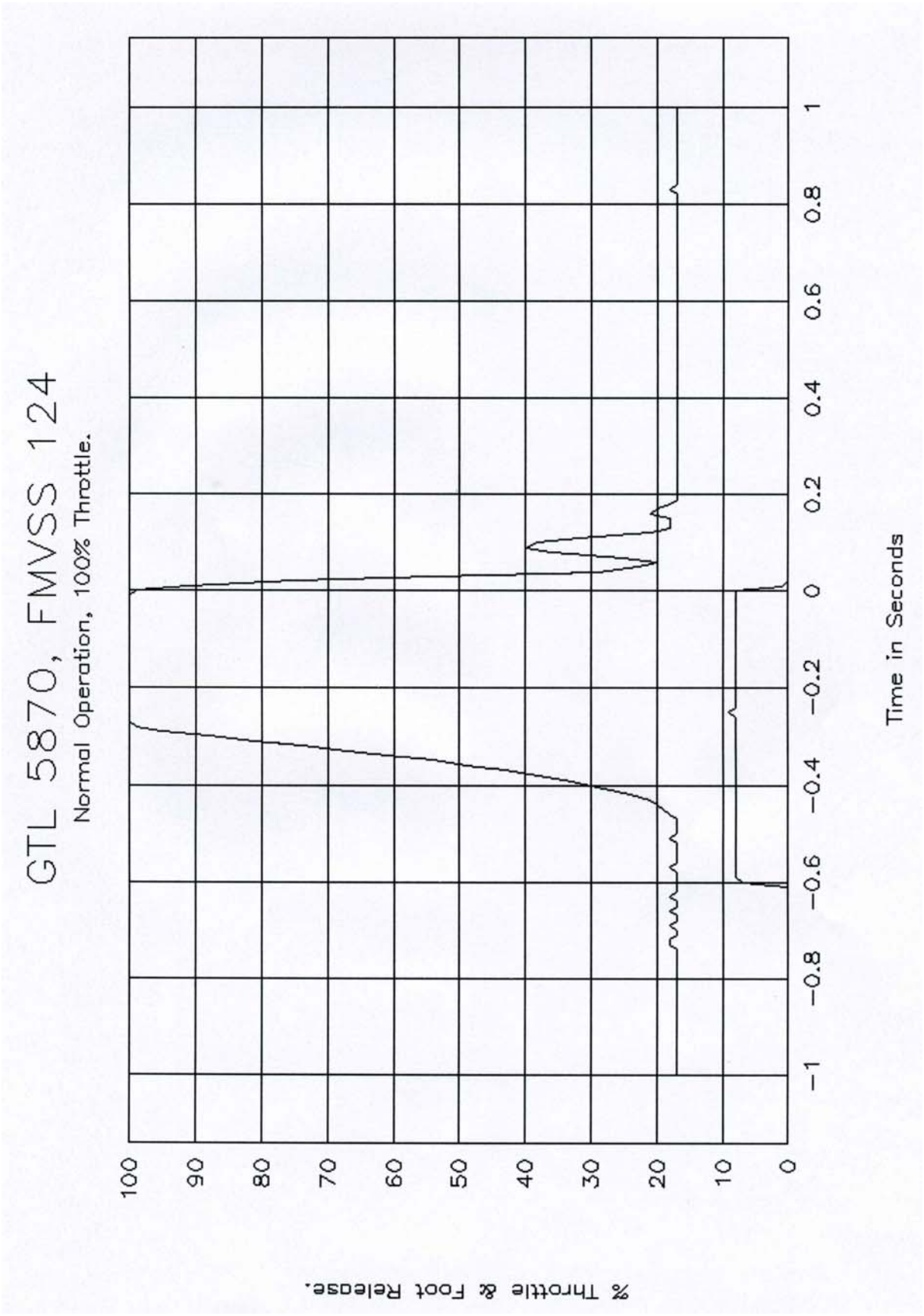
FIGURE 5.11
OVERALL VIEW OF TEST SET-UP

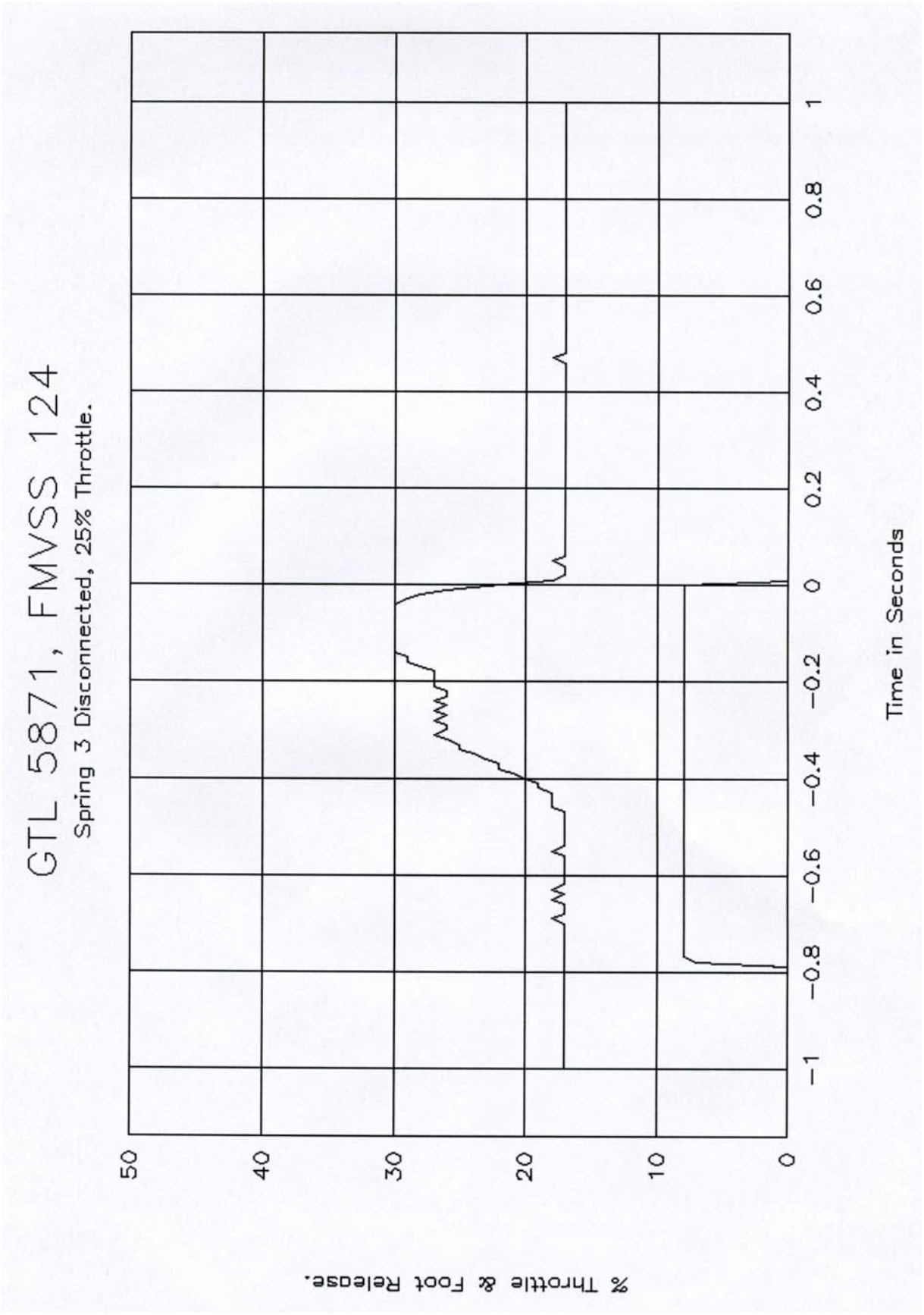
SECTION 6
PLOTS

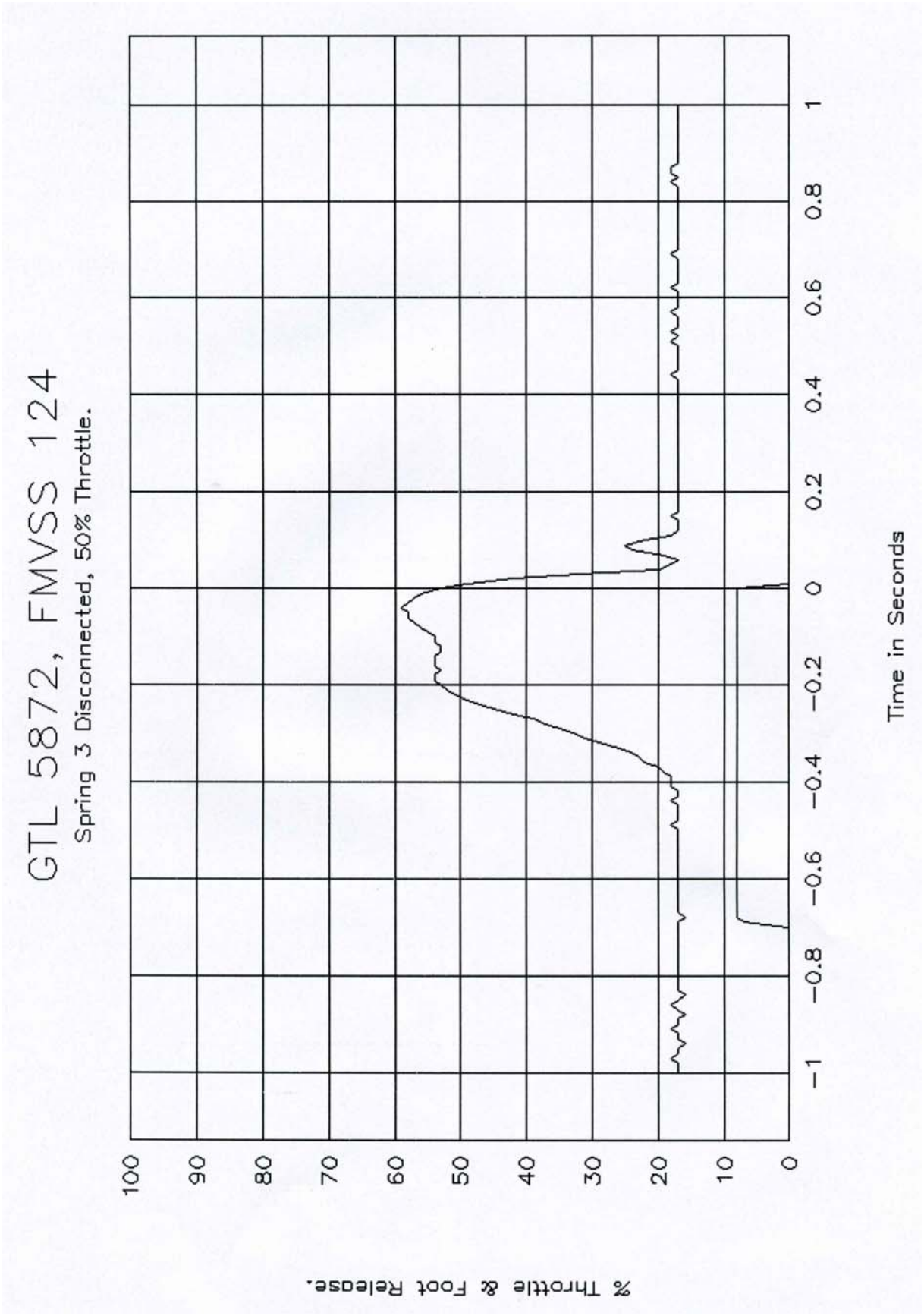

GTL 5867, FMVSS 124
Normal Operation, 25% Throttle.
% Throttle & Foot Release.
50
40
30
20
10
0
−1
−0.8
−0.6
−0.4
−0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds

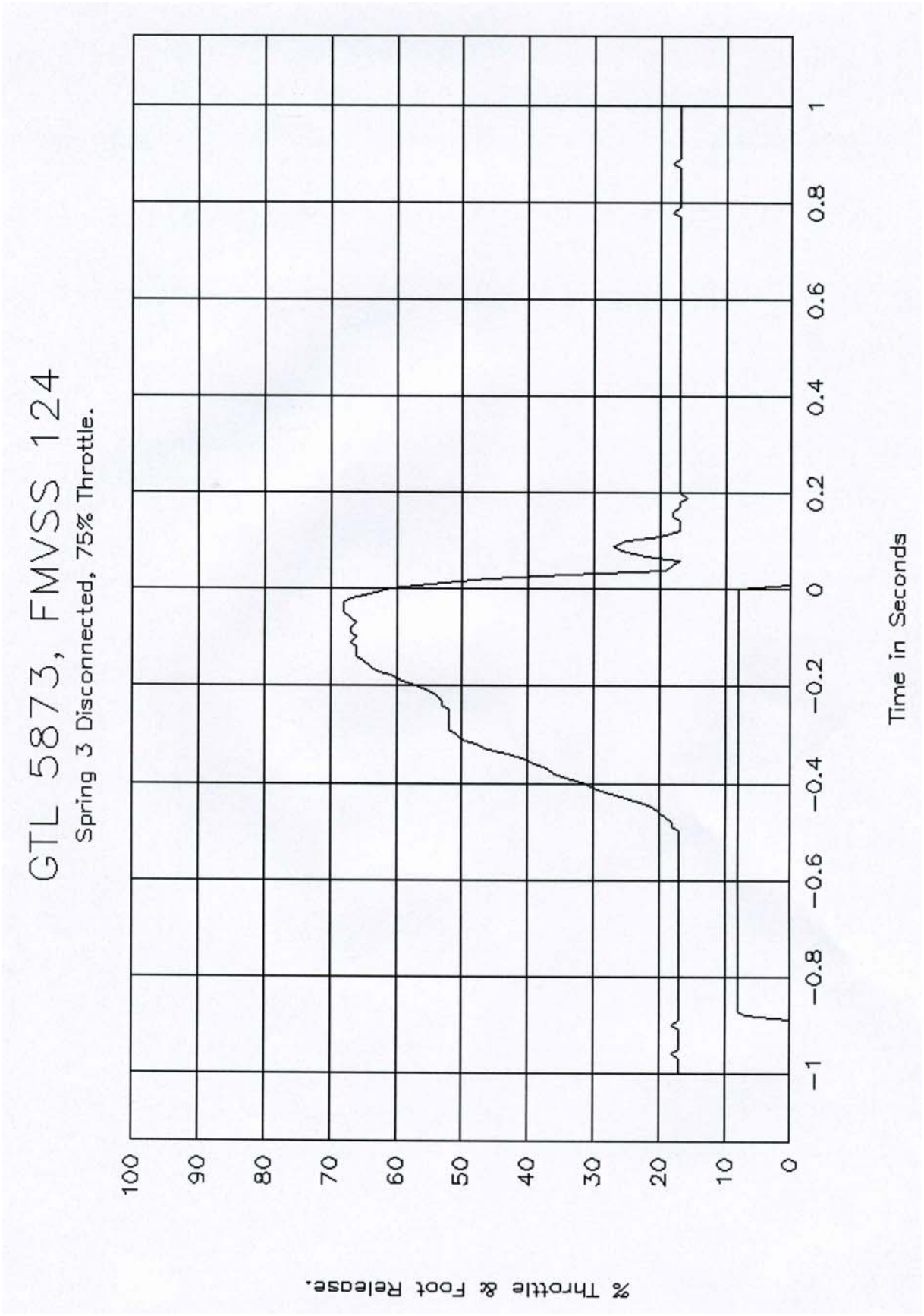

GTL 5868, FMVSS 124
Normal Operation, 50% Throttle.
% Throttle & Foot Release.
100
90
80
70
60
50
40
30
20
10
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds

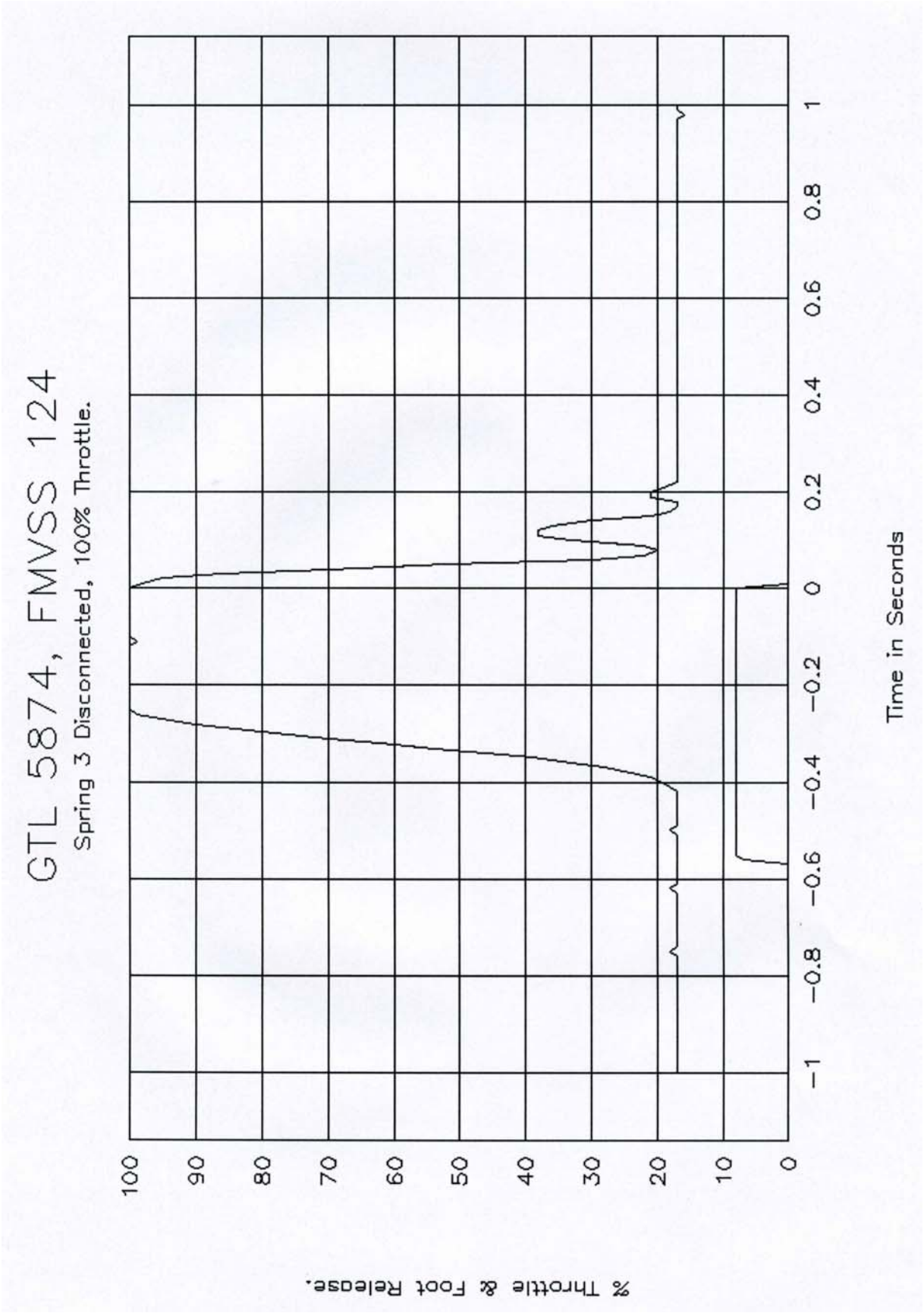

GTL 5869, FMVSS 124
Normal Operation, 75% Throttle.
% Throttle & Foot Release.
100
90
80
70
60
50
40
30
20
10
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds

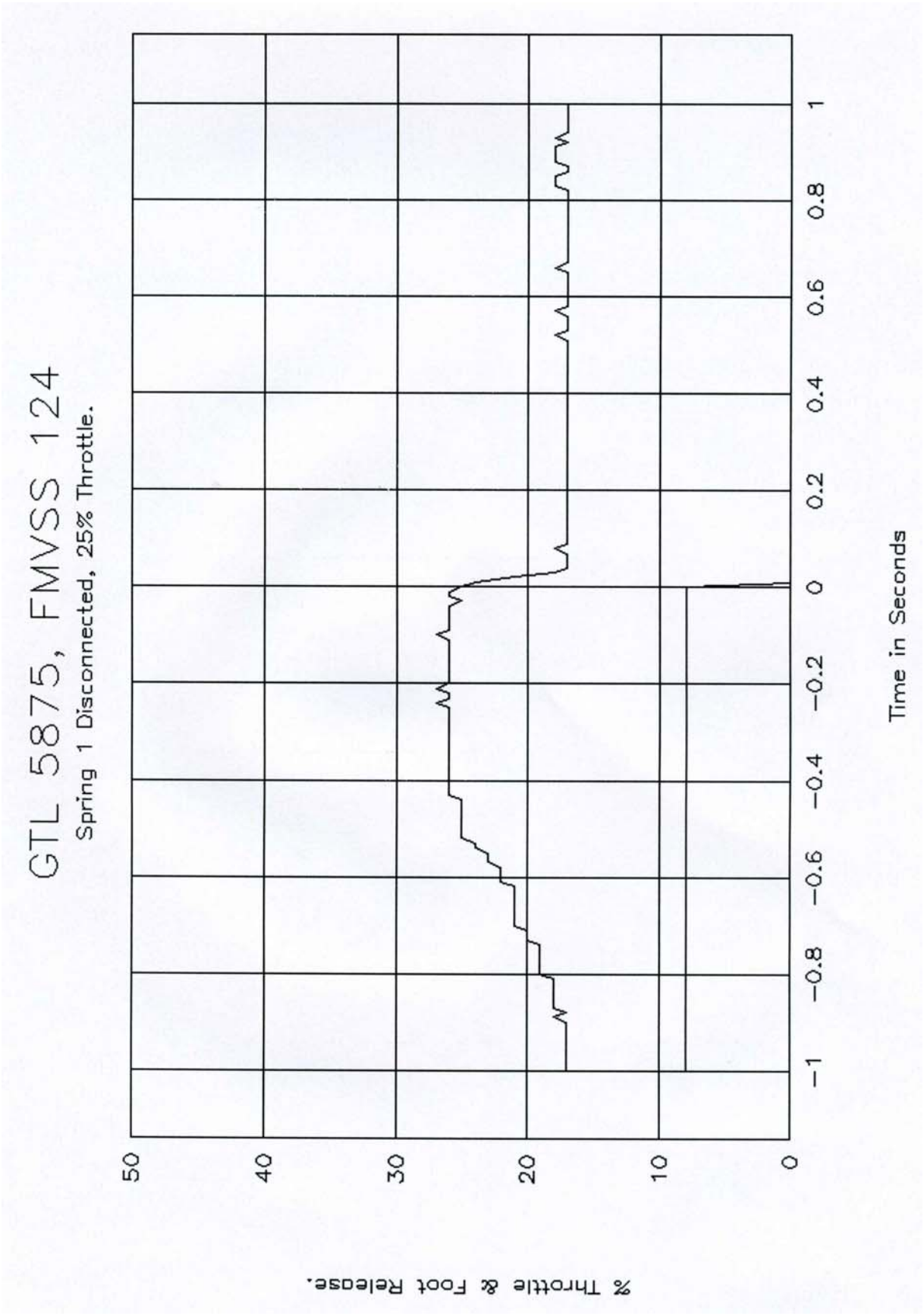

GTL 5870, FMVSS 124
Normal Operation, 100% Throttle.
% Throttle & Foot Release.
100
90
80
70
60
50
40
30
20
10
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds

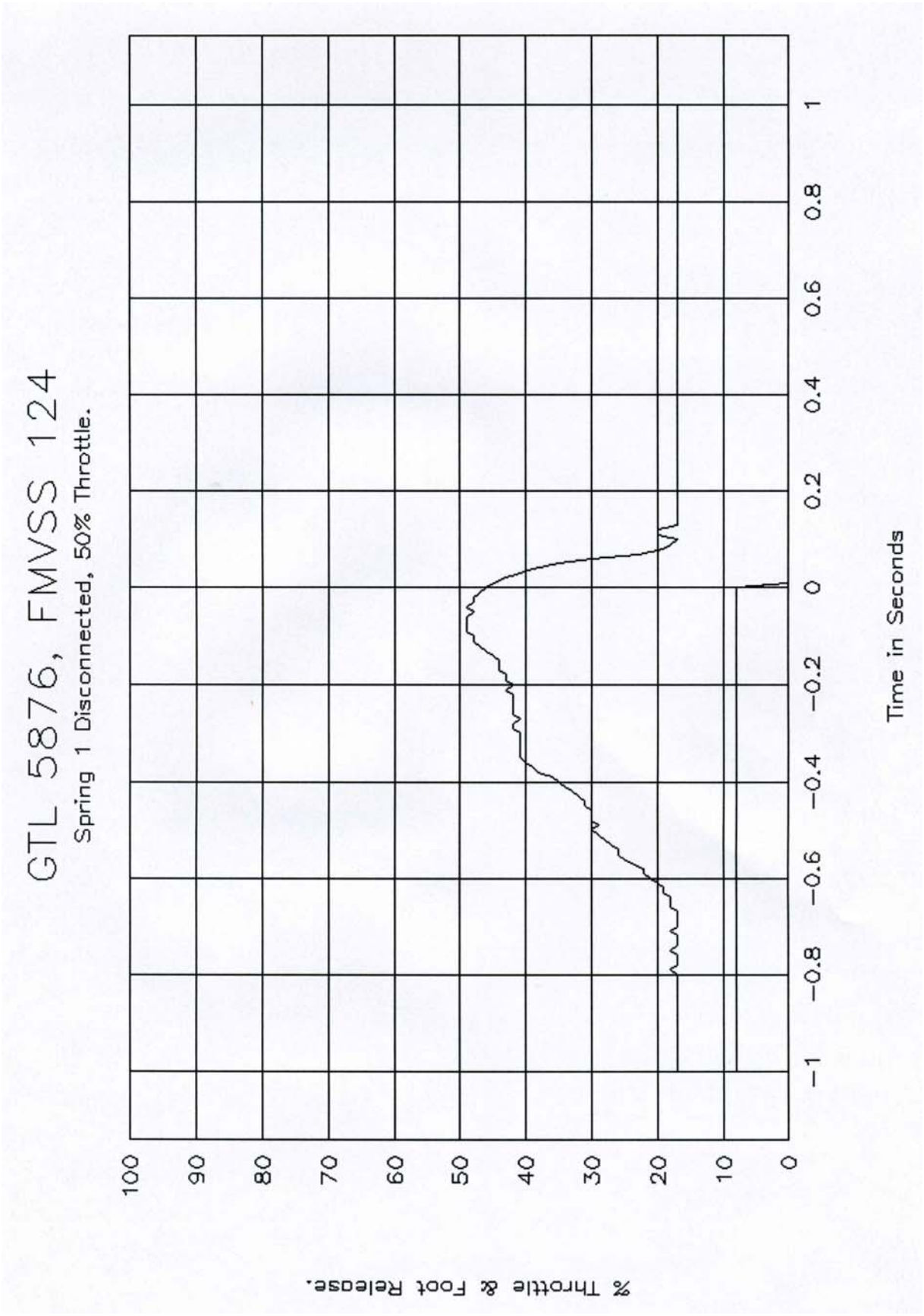

GTL 5871, FMVSS 124
Spring 3 Disconnected, 25% Throttle.
% Throttle & Foot Release.
50
40
30
20
10
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds

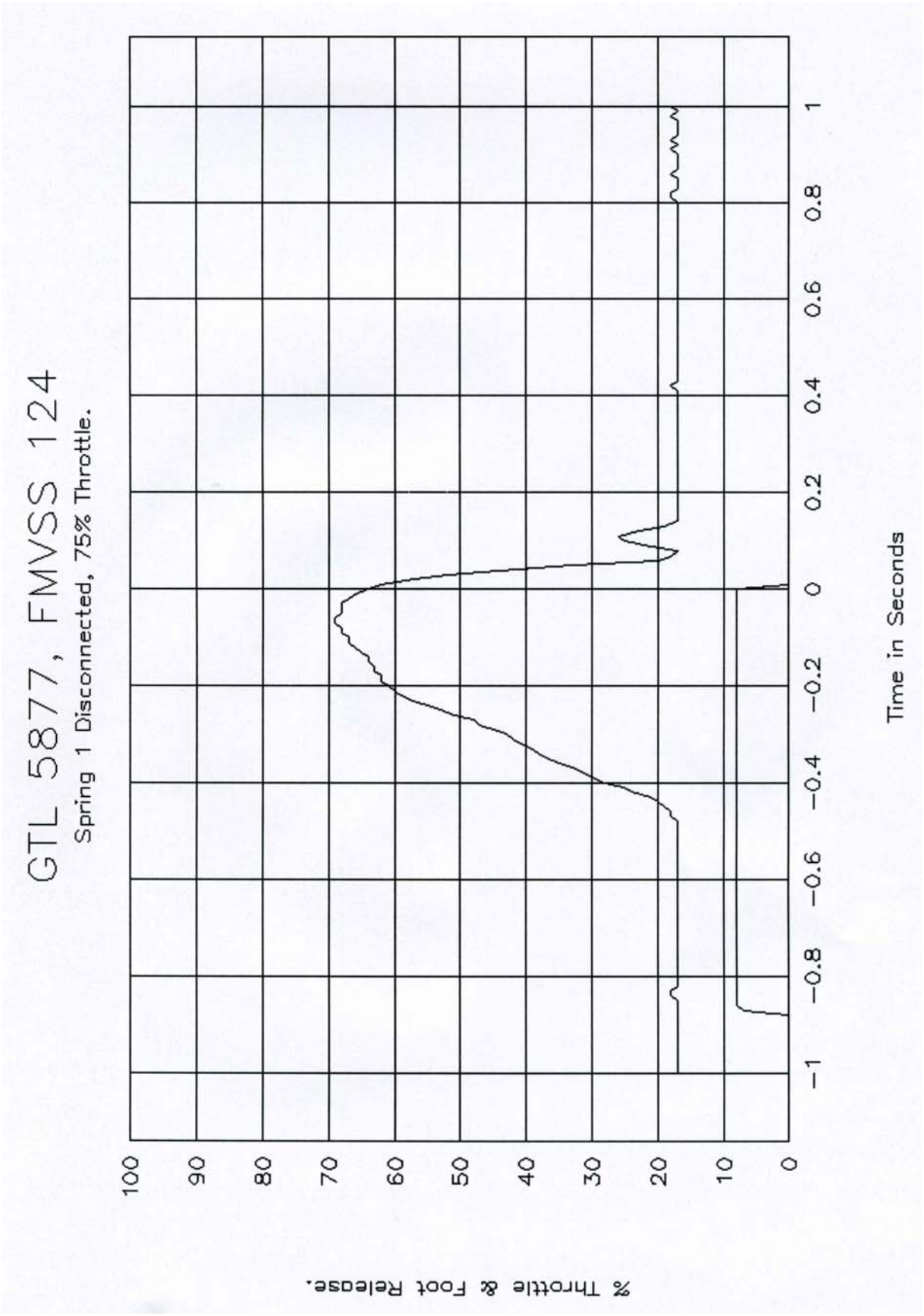

GTL 5872, FMVSS 124
Spring 3 Disconnected, 50% Throttle.
% Throttle & Foot Release.
100
90
80
70
60
50
40
30
20
10
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds

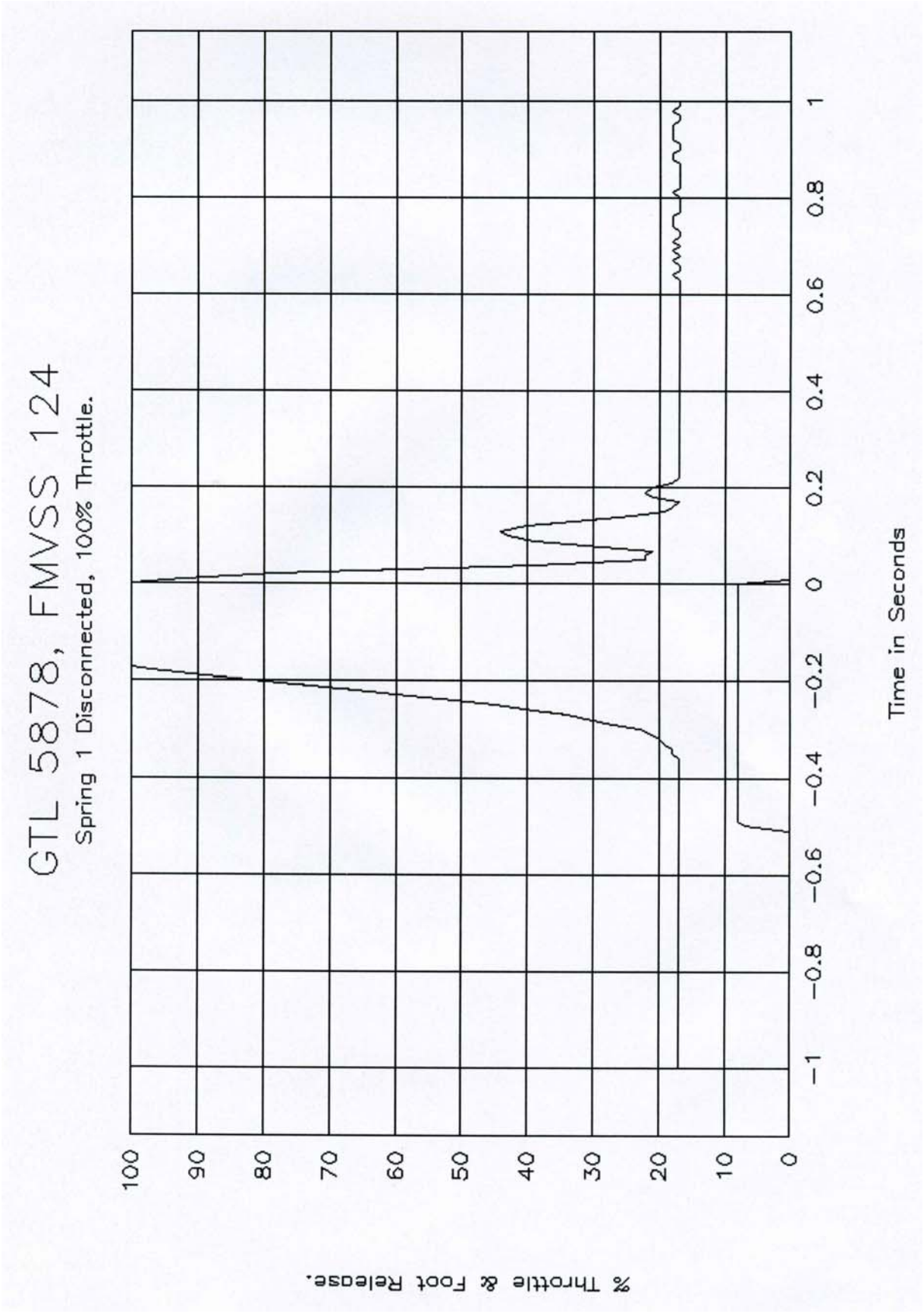

GTL 5873, FMVSS 124
Spring 3 Disconnected, 75% Throttle.
% Throttle & Foot Release.
100
90
80
70
60
50
40
30
20
10
0
−1
−0.8
−0.6
−0.4
−0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds

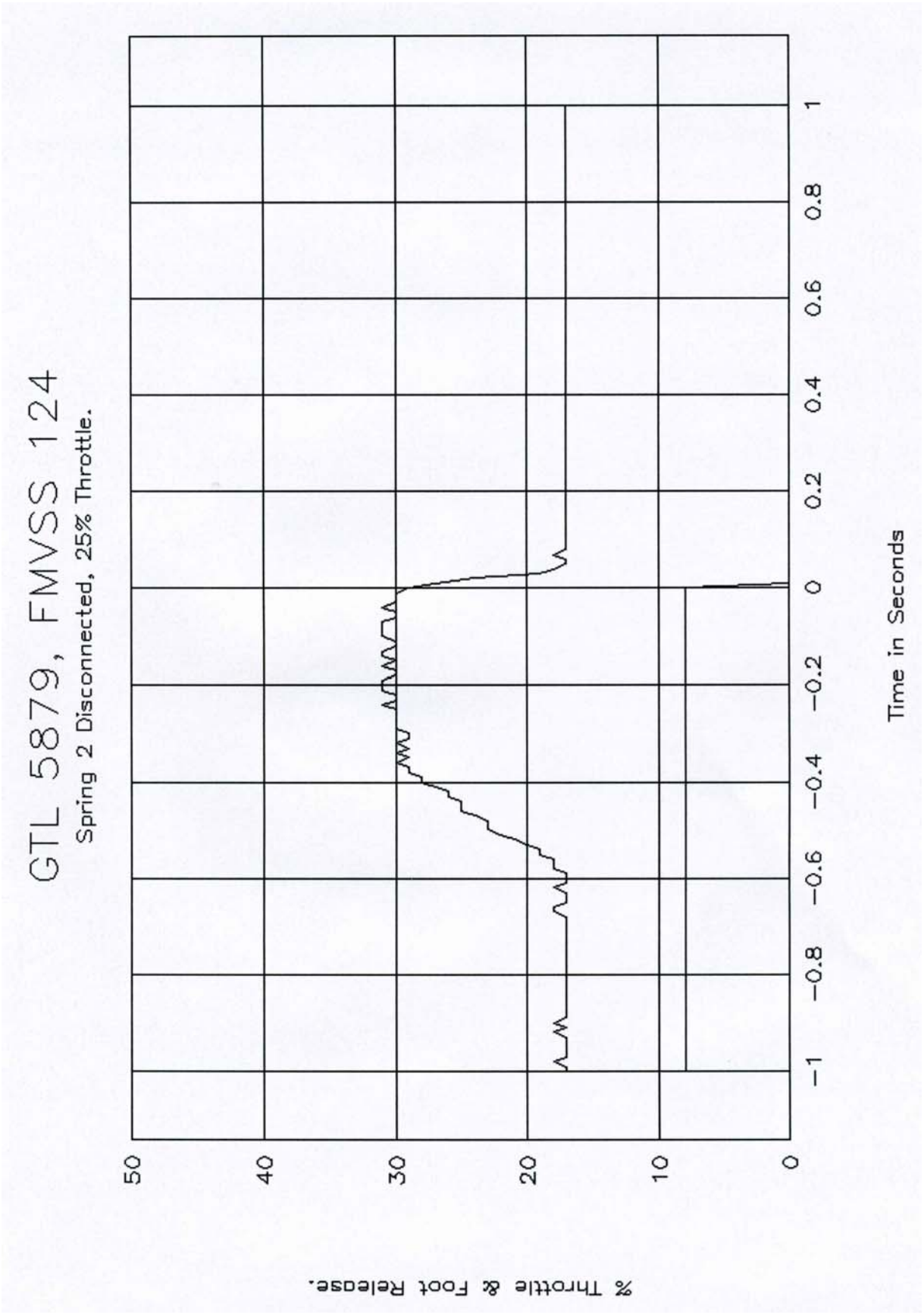

GTL 5874, FMVSS 124
Spring 3 Disconnected, 100% Throttle.
% Throttle & Foot Release.
100
90
80
70
60
50
40
30
20
10
0
−1
−0.8
−0.6
−0.4
−0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds


GTL 5875, FMVSS 124
Spring 1 Disconnected, 25% Throttle.
% Throttle & Foot Release.
50
40
30
20
10
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds


GTL 5876, FMVSS 124
Spring 1 Disconnected, 50% Throttle.
% Throttle & Foot Release.
100
90
80
70
60
50
40
30
20
10
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds


GTL 5877, FMVSS 124
Spring 1 Disconnected, 75% Throttle.
% Throttle & Foot Release.
100
90
80
70
60
50
40
30
20
10
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds


GTL 5878, FMVSS 124
Spring 1 Disconnected, 100% Throttle.
% Throttle & Foot Release.
100
90
80
70
60
50
40
30
20
10
0
−1
−0.8
−0.6
−0.4
−0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds


GTL 5879, FMVSS 124
Spring 2 Disconnected, 25% Throttle.
% Throttle & Foot Release.
50
40
30
20
10
0
−1
−0.8
−0.6
−0.4
−0.2
0
0.2
0.4
0.6
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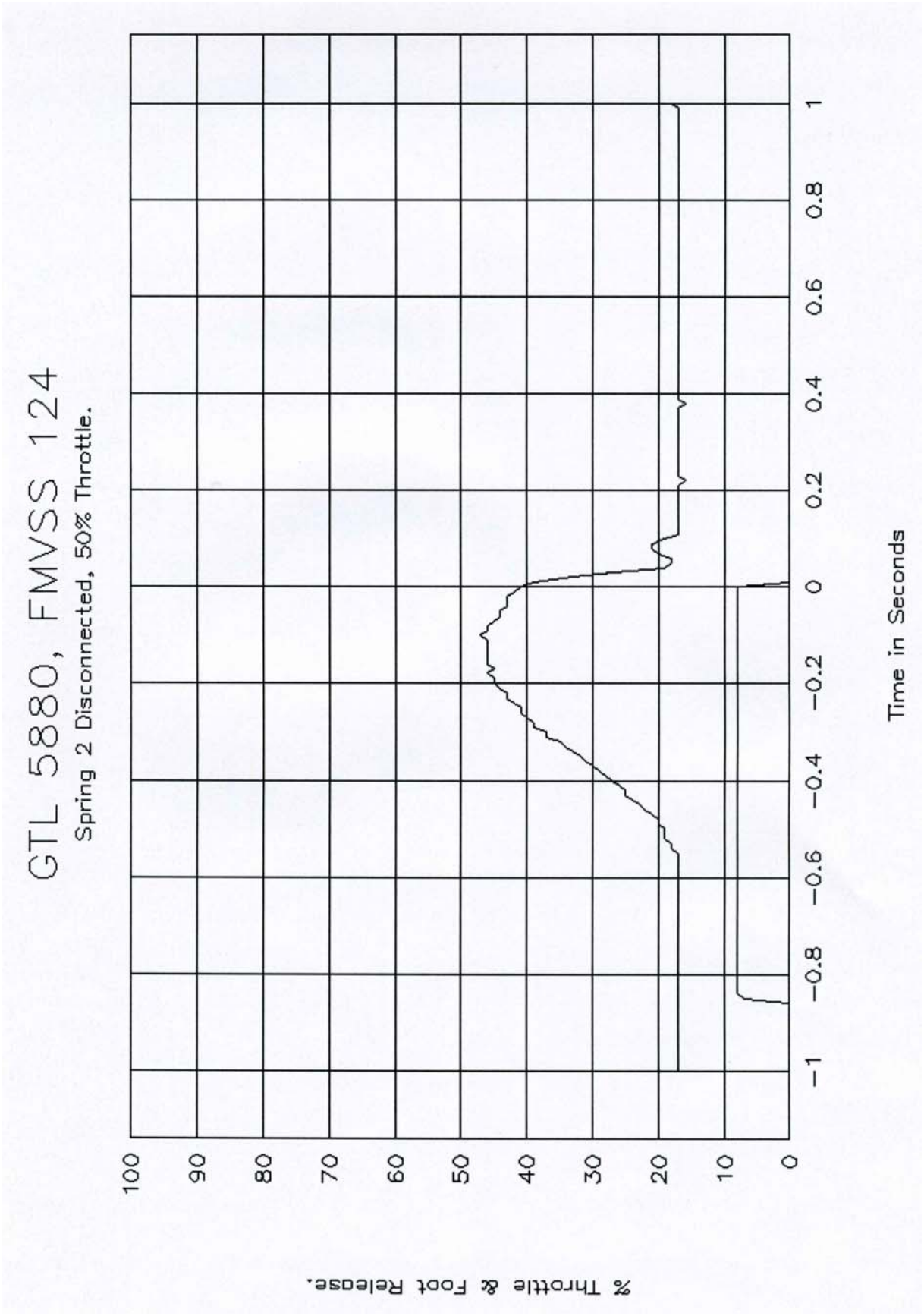
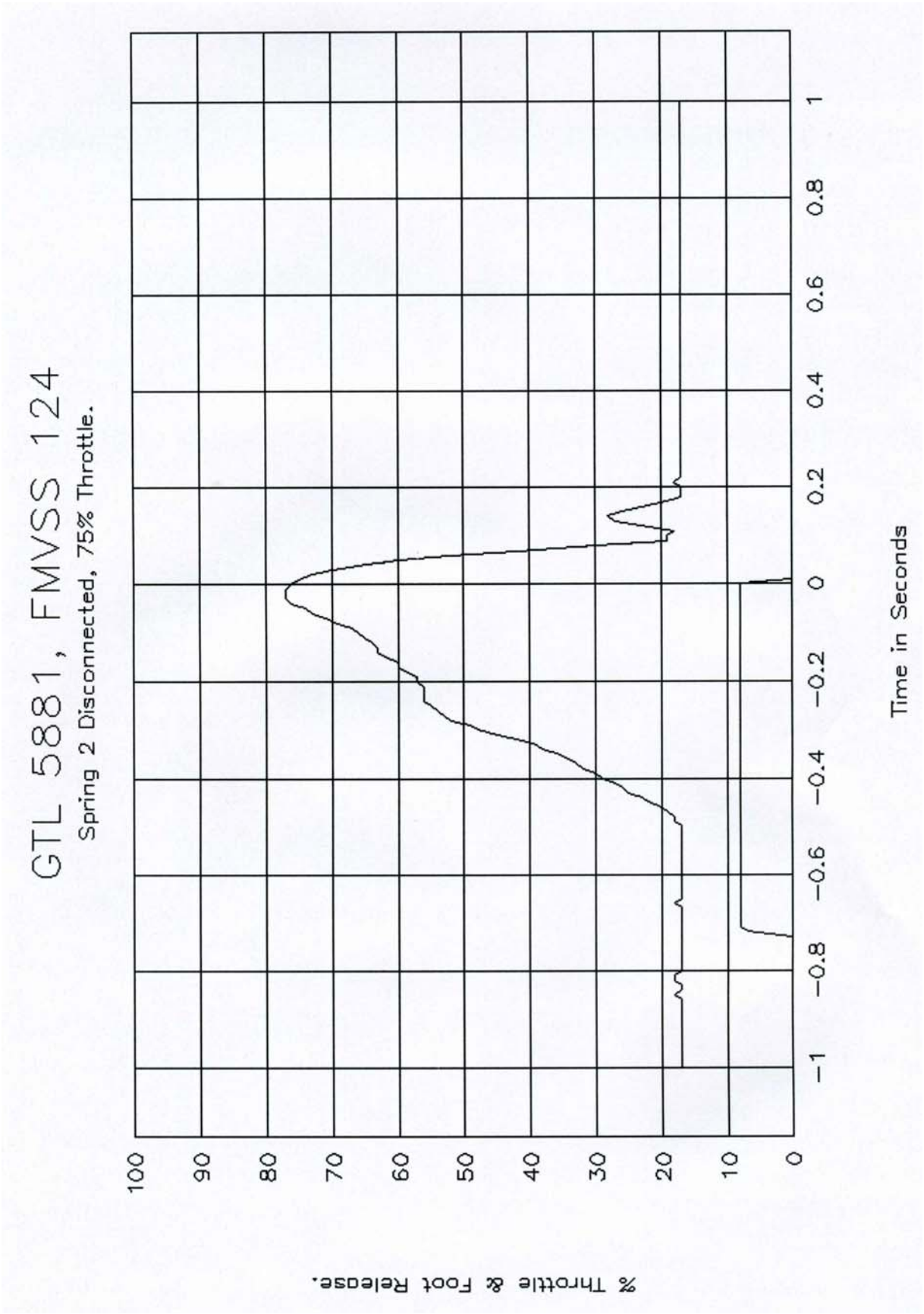
1
Time in Seconds


GTL 5880, FMVSS 124
Spring 2 Disconnected, 50% Throttle.
% Throttle & Foot Release.
100
90
80
70
60
50
40
30
20
10
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds


GTL 5881, FMVSS 124
Spring 2 Disconnected, 75% Throttle.
% Throttle & Foot Release.
100
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−0.6
−0.4
−0.2
0
0.2
0.4
0.6
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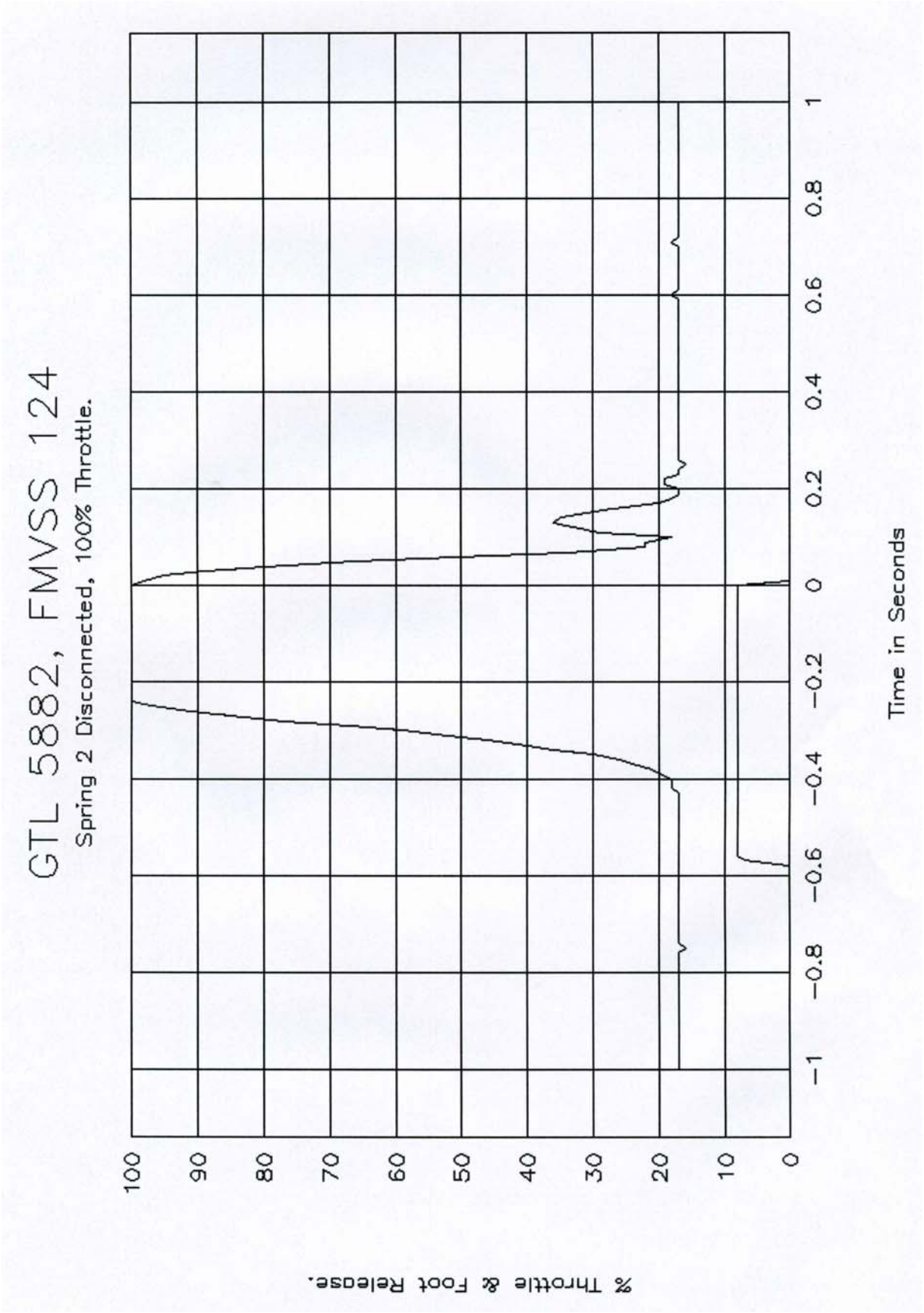
1
Time in Seconds


GTL 5882, FMVSS 124
Spring 2 Disconnected, 100% Throttle.
% Throttle & Foot Release.
100
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-0.8
-0.6
-0.4
-0.2
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0.2
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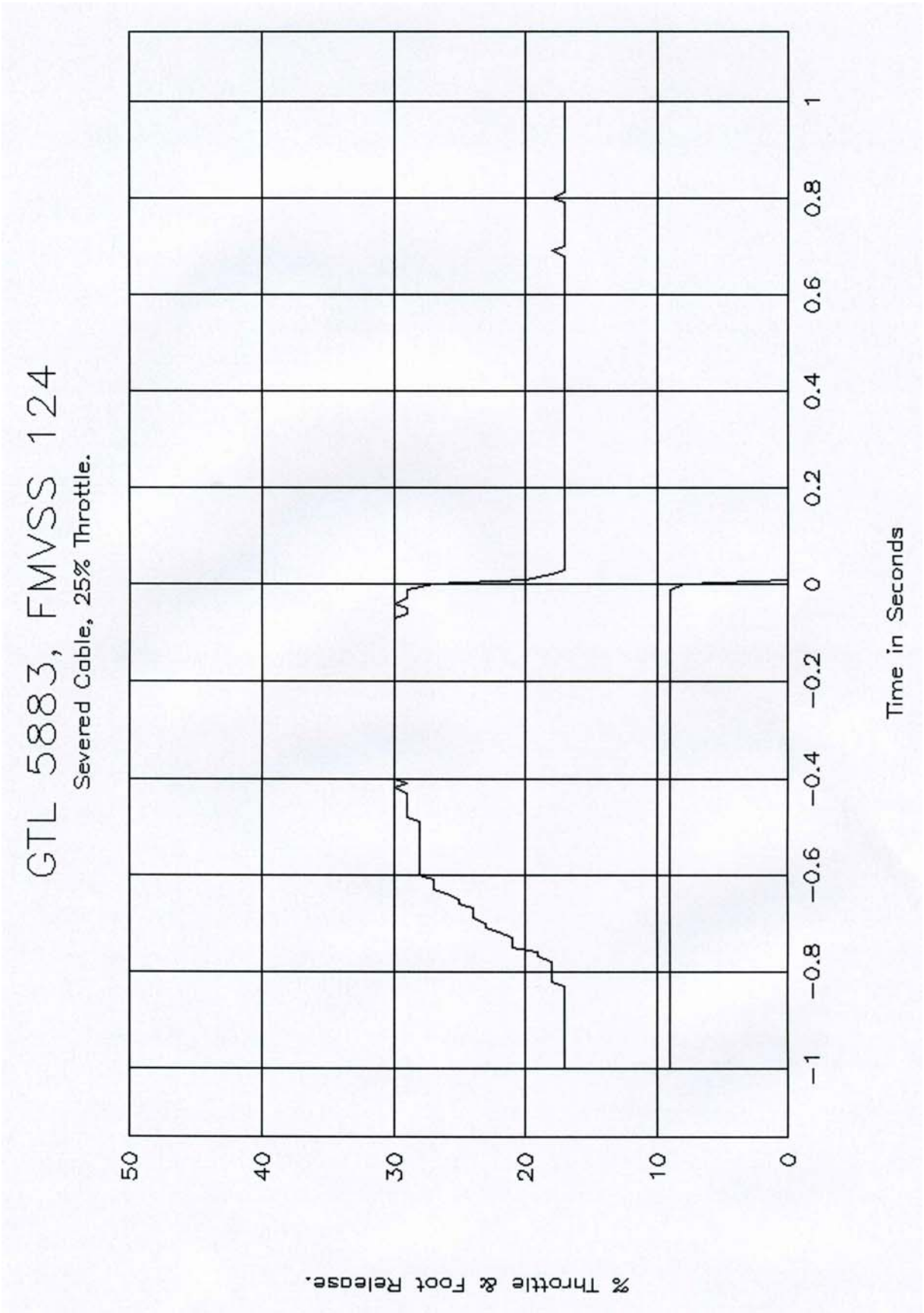
1
Time in Seconds


GTL 5883, FMVSS 124
Severed Cable, 25% Throttle.
% Throttle & Foot Release.
50
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-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
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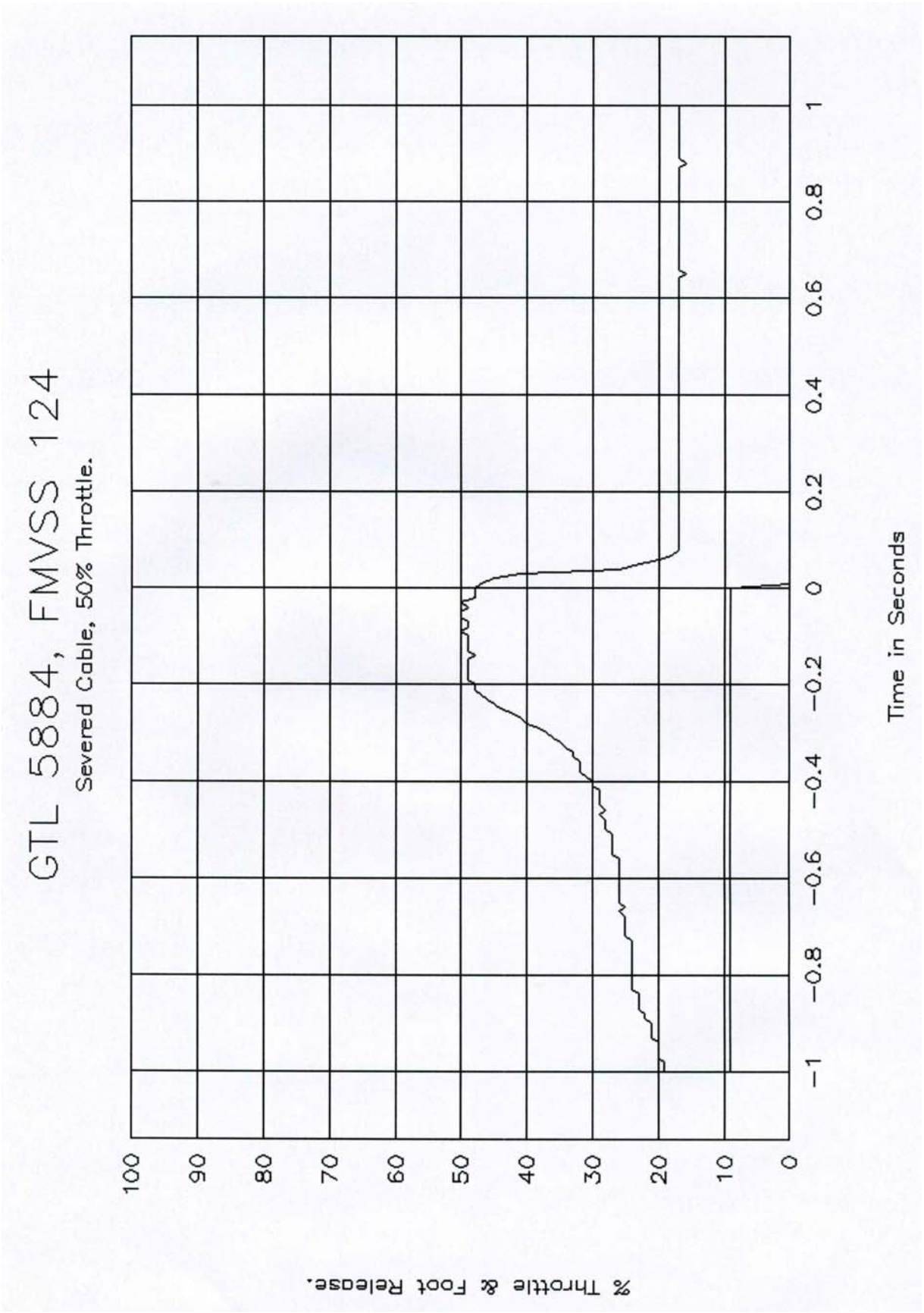
1
Time in Seconds


GTL 5884, FMVSS 124
Severed Cable, 50% Throttle.
% Throttle & Foot Release.
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−0.6
−0.4
−0.2
0
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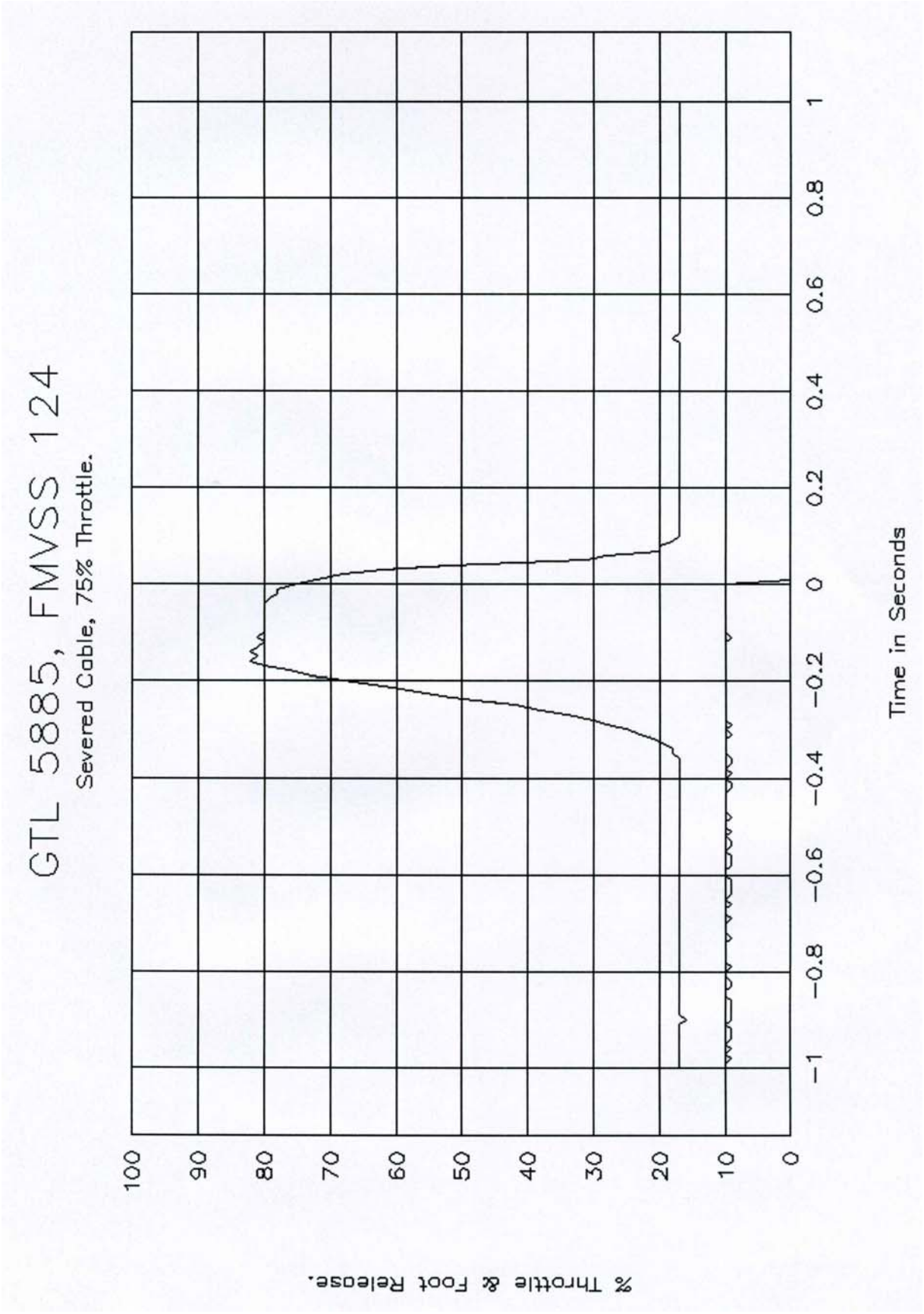
0.4
0.6
0.8
1
Time in Seconds


GTL 5885, FMVSS 124
Severed Cable, 75% Throttle.
% Throttle & Foot Release.
100
90
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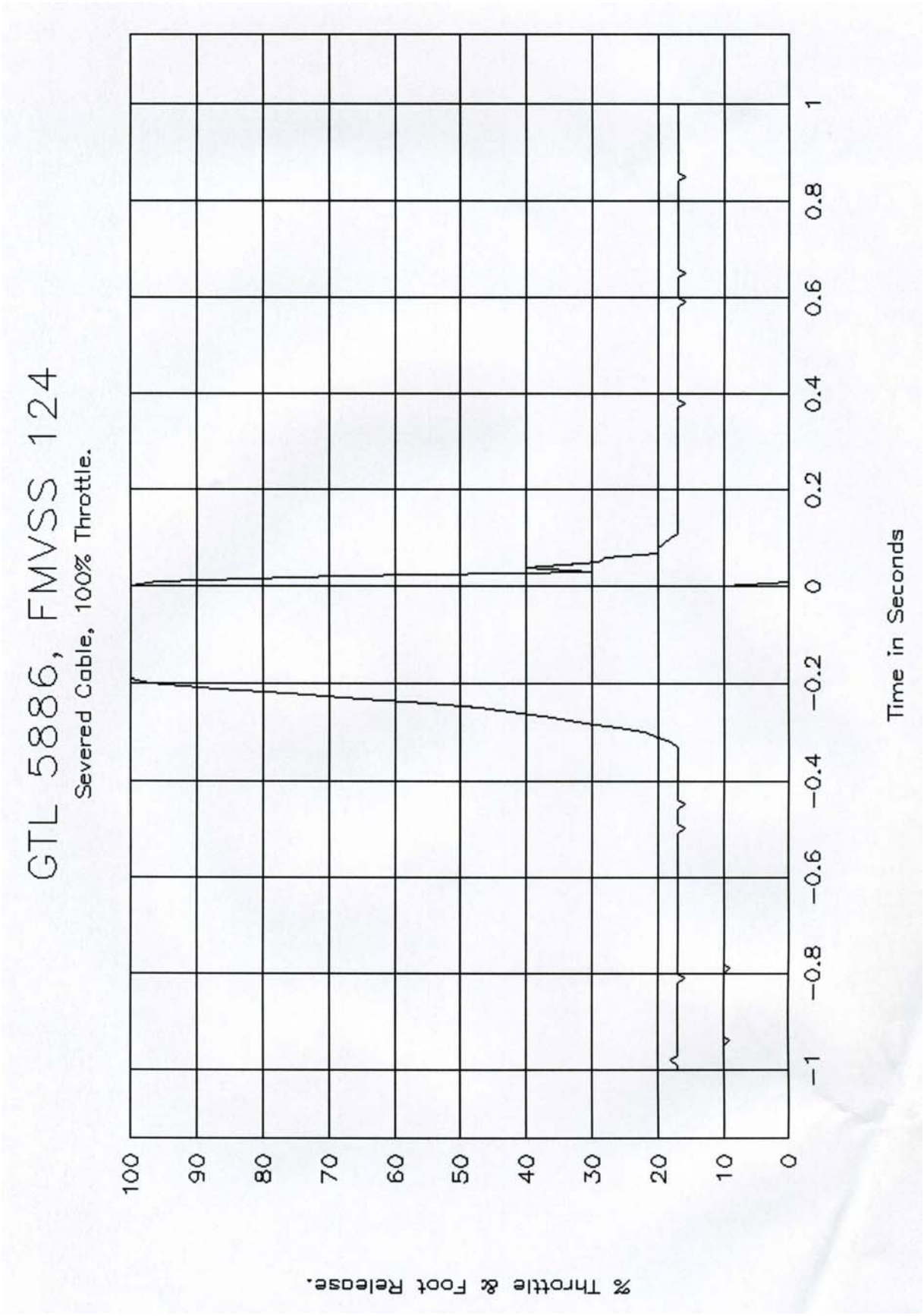
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Time in Seconds


GTL 5886, FMVSS 124
Severed Cable, 100% Throttle.
% Throttle & Foot Release.
100
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1
Time in Seconds

SECTION 7
MANUFACTURER'S DRAWINGS

11/5/07

FORM – 124
Rev. 10/24/2003

VEHICLE INFORMATION / TEST SPECIFICATIONS

FMVSS No. 124

07MY SUZUKI Aerio, 4-Dr Sedan

Requested Information:

1. A sketch of the driver operated accelerator control system (ACS) starting from the accelerator pedal up to and including the fuel metering device (carburetor, fuel injectors, fuel distributor, or fuel injection pump).

   > See attachment 1

2. For Normal ACS operation, the method utilized to determine the engine idle state (air throttle plate position, fuel delivery rate, other).

   > Air throttle plate position.

3. For Fail-Safe operation of the ACS (disconnection or severance), the method utilized to determine return of engine power to the idle state (air throttle plate position, fuel delivery rate, air intake, engine rpm, other)

   > Air throttle plate position.

4. Is the vehicle ACS equipped with any of the following:

   A. Accelerator Pedal Position Sensor (APS) > No.
   B. Throttle Plate Position Sensor (TPS) > Yes.
   C. Electronic Control Module (ECM) > No.
   D. Air throttle plate actuator motor > No.

5. If air throttle plate equipped, is there a procedure which can be utilized by the test laboratory to measure the position of the throttle plate by tapping into the TPS or ECM? If so, please describe.

   > See attachment 2

6. Point(s) chosen to demonstrate compliance with FMVSS No. 124 for single point disconnect and severance.

   > See attachment 3

7. Where applicable, were connections in the ACS beyond the ECM such as the fuel injectors tested for disconnection and severance. If yes, provide details.

   > No.

8. Where applicable, were idle return times tested for electrical severance accompanied by shorting to ground? If yes, please provide details.

   > No.

9. All sources of return energy (springs) for the accelerator pedal and if applicable, the air throttle plate.

   > Springs.

10. If fuel delivery rate is used to demonstrate return to idle state, provide: > No.

    A. The method used to measure this signal i.e. connection to standard SAE J1587 data bus.
    B. Equipment required to measure signal.

11. Fuel rate signal output range at the idle state.

    > No.

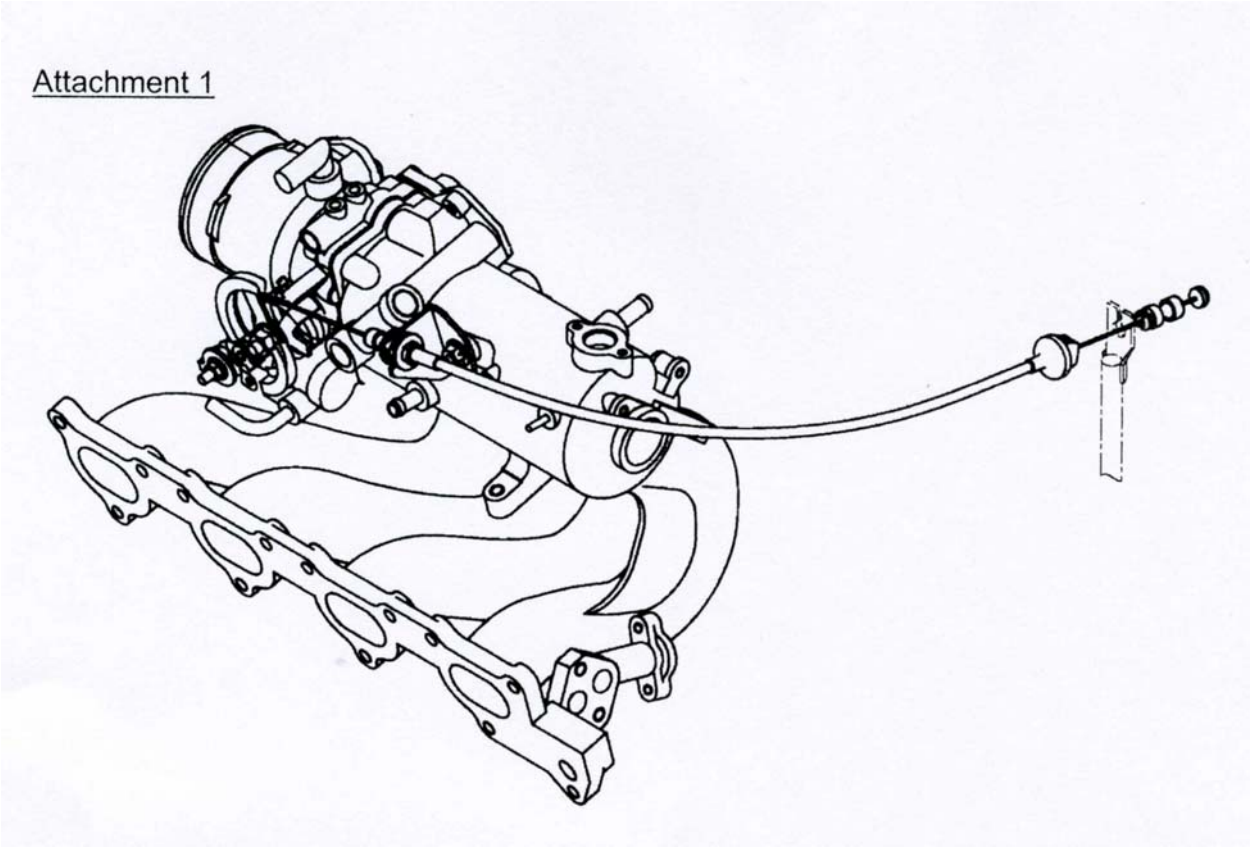
12. Is the ACS equipped with a limp home mode? If yes, provide operation description.

    > No.

13. Method by which the test laboratory can record engine RPM by connection to ECM, OBD connector, etc.

    > Connect service tool "Tech 2" to OBD connector.

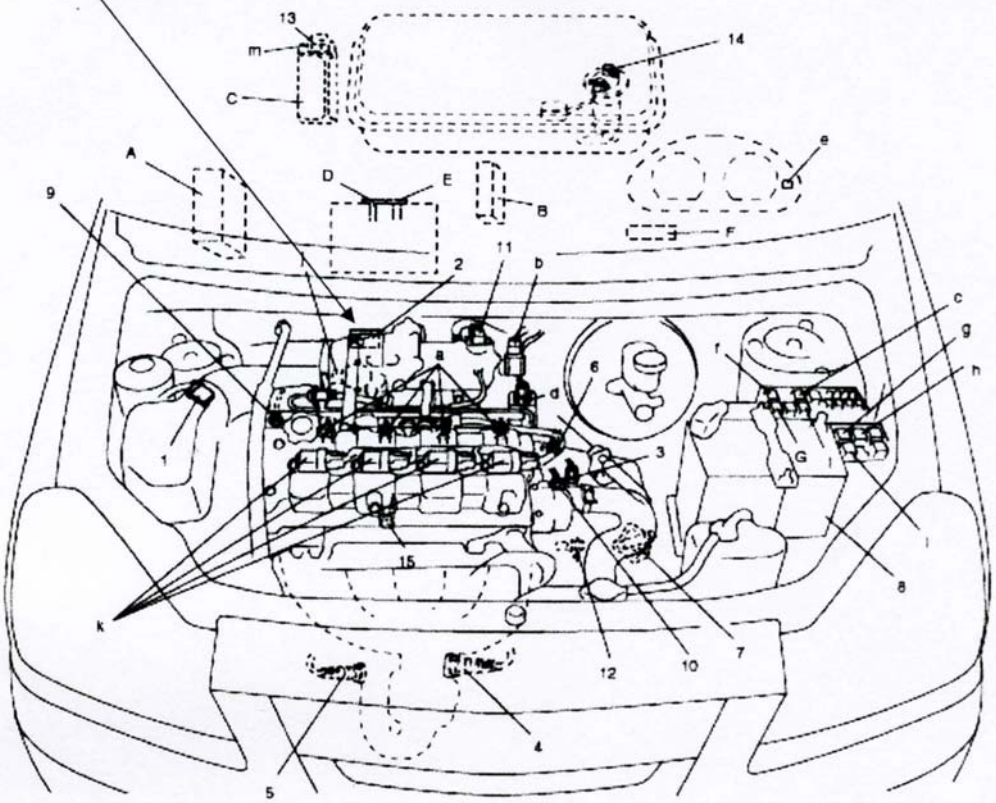
Attachment 1



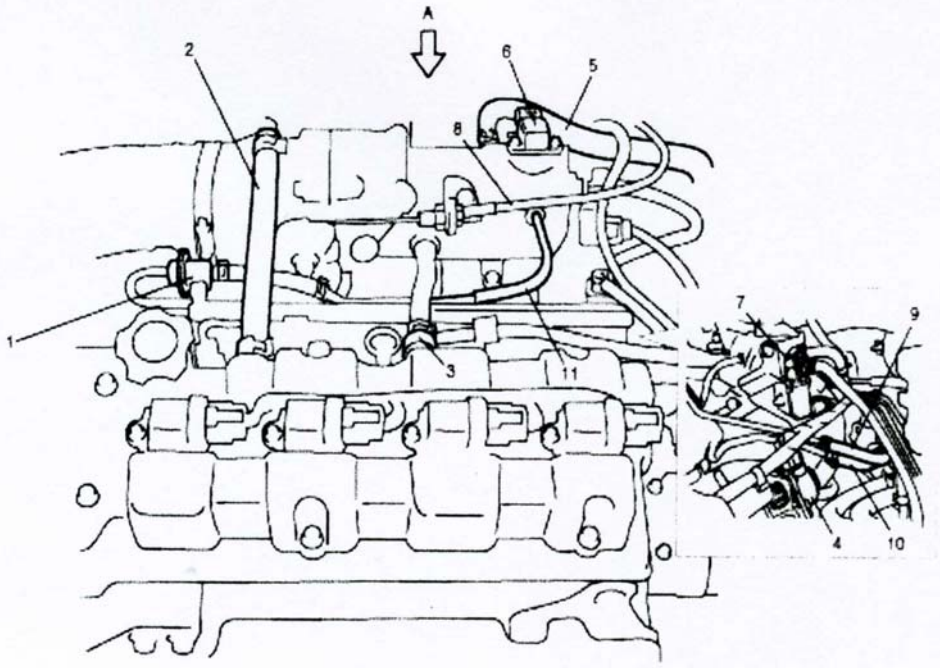
Attachment 2

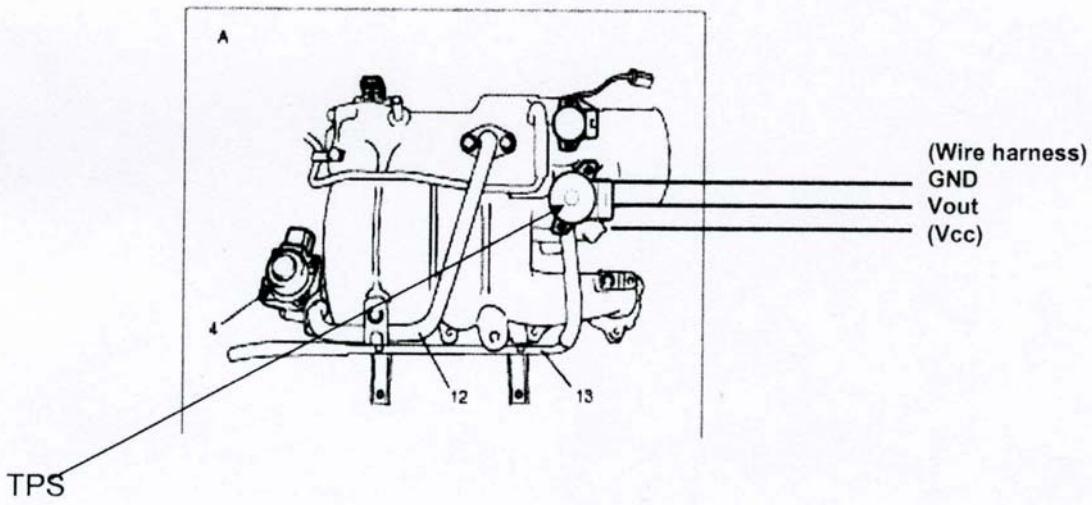
Location

Throttle Position Sensor (TPS)



Detail





Measure voltage between Vout and GND of wire harness for throttle plate position.
Idle (fully closed throttle plate): 0.7V + - 0.15V
WOT (fully open throttle plate): 4.0V + - 0.5V
(0.04 V/deg)

Attachment 3