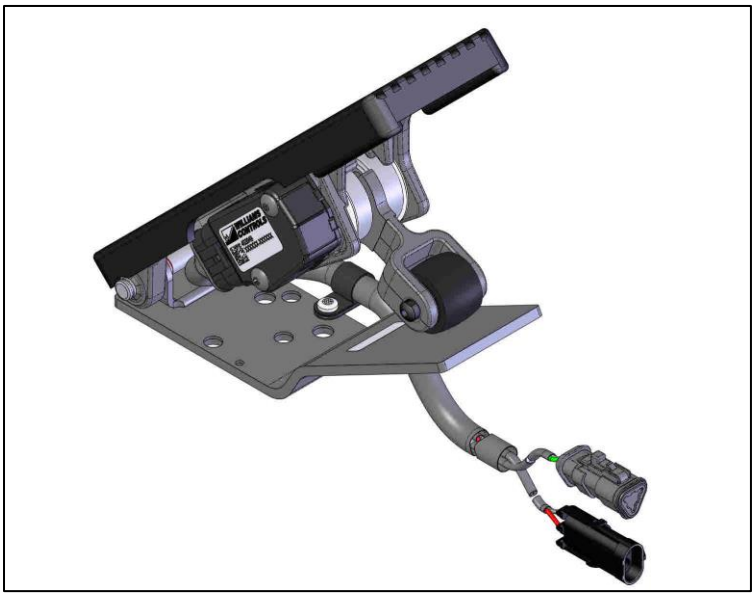


Description:

The WM-526 Electronic Floor Pedal Assembly uses a non-contact sensor with CANBUS APS/IVS output. The sensor provides a linear digital output proportional to the angular displacement of the treadle.

Applications:

- Electronic Floor Pedal Assembly
  - Bus Throttle pedal with position sensor

Absolute Maximum Electrical/Mechanical Ratings

Operational Supply Voltage	+9V to +32V
Non-operational Supply Voltage	35V
Non-operational Reverse Voltage	-35V
Output Current	45mA
Short circuit duration to ground	Indefinite
Short circuit duration to VBAT	Indefinite
Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C
Static Load Limit	1500 N measured 200 mm from pivot

Operation of this device beyond absolute maximum ratings may result in permanent damage.

Vehicle System Safety Information:

During FMEA analysis (Failure Modes and Effects Analysis, a.k.a. Hazard Analysis), Williams Controls (WMCO) has identified the following potential failure mode of its Non-Contact Sensors that cannot be mitigated within the sensor assembly:

Sensor outputs APS1/APS2 (applicable for Dual APS Sensor only) or APS/IVS outputs (applicable for APS/IVS Sensors only) could get “stuck” at an arbitrary CANBUS message output within the operating range of the sensor.

This potential failure mode cannot be detected and/or resolved within the sensor assembly itself and diagnostic information about this issue cannot be transmitted and/or generated by the sensor assembly, but must be detected by the vehicle power-train control system(s). To mitigate this potential failure mode, WMCO designed and released sensors that feature dual redundant hall dies to generate a CANBUS message that contain APS1/APS2 (for Dual APS Sensors), or APS/IVS (for APS/IVS Sensors). This sensor will produce two independent output messages that are in direct correlation with each other (embedded within a single CANBUS frame).

To mitigate the risk named above, Williams Controls strongly recommends using the sensor’s built-in redundancy feature. The APS1 signal would be used as the source of accelerator position signal information, and APS2 signal (or IVS signal, depending on sensor type) would be used to determine the validity of APS1. The comparison of APS2 (or IVS) signal with APS1 signal enables the vehicle to fully detect the described “stuck” output failure mode.

Software algorithms specifically designed for this purpose (e.g. “stuck throttle routine”, “stuck pedal routine”...) are commonly used in the industry and are known to mitigate this risk.

Electrical Specifications

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{CC}	APS Supply Voltage		9		32	V
$I_{CC1,2}$	APS Current	Per Channel		45	75	mA
Over Life Product Output Specifications						
$APS1_{CT}$	CT Output, APS1 (1 byte)	$\theta < \theta_{CT}$	-0.5	0 (0x00h)	0.5	CNT
$APS1_{WOT}$	WOT Output, APS1 (1 byte)	$\theta > \theta_{WOT}$	249.5	250 (0xFAh)	250.5	CNT
Linearity	Overall Output Linearity		-5	-	+5	% of CNT_{MAX}
APS_{SPAN}	Span Output (1 byte)	θ_{CT} to θ_{WOT}	249.5	250 (0xFAh)	250.5	CNT
CNT_{IVS1}	IVS1 Switch Point (1 byte)		10	18 (0x12h)	26	CNT
$IVS1_{Idle}$	IVS1 output when idle (2 bits)	$\theta < \theta_{IVS1}$	0.5	0x01b	1.5	CNT
$IVS1_{Not\ Idle}$	IVS1 output when not idle (2 bits)	$\theta > \theta_{IVS1}$	-0.5	0x00b	0.5	CNT
DM1	Sensor Error Status Message (8 bytes)			0x00FF00000000FFh		-

Mechanical Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
Treadle Start Angle	See Drawing	43	45	47	°
Pedal Angular Rotation	See Drawing	15	17	19	°
Initial Pedal Travel Force (IPTF)	Measured 150 mm from pivot pin normal to treadle		25		N
Full Pedal Travel Force (FPTF)	Measured 150 mm from pivot pin normal to treadle		50		N
Return Pedal Force (RPF)	Measured 150 mm from pivot pin normal to treadle	5			N

Software Specifications

CAN Sensor BUS and Message Description		
Message Information		
Communication Standard	J1939	
Communication Speed	Autobaud detection between 500K/250K	
Parameter Group Number (PGN)	61443 (0xF003h)	
Transmission Repetition Rate	50msec	
Extended Data Page	0	
Data Page	0	
Default Priority	3	
PDU Format	240 (0xF0h)	
PDU Specific	3 (0x03h)	
Source Address	130(0x82h)	
Data Length	8	
Message Signals		
Start Position	Parameter	SPN
1.1	Accelerator Pedal 1 Low Idle Switch	558
1.3	not used (0x11b)	-
1.5	not used (0x11b)	-
1.7	not used (0x11b)	-
2	Accelerator Pedal Position 1	91
3	not used (0xFFh)	-
4	not used (0xFFh)	-
5	not used (0xFFh)	-
6.1	not used (0x11b)	-
6.3	not used (0x111111b)	-
7	not used (0xFFh)	-
8	not used (0xFFh)	-
Signal Descriptions		
SPN 91	Accelerator Pedal Position 1	
Description:	This parameter is for the primary accelerator control used to indicate rotary position of the throttle pedal.	
Data Range:	1 byte	
Resolution:	0.4 %/bit, 0 offset	
Data Range:	0 to 100%	Operational Range: same as data range
SPN 558	Accelerator Pedal 1 Low Idle Switch	
Description:	This parameter is for the switch signal which indicates the state of the accelerator pedal 1 low idle switch as defined in SAEJ1843.	
Data Range:	2 bits	
Resolution:	4 states/2bit, 0 offset	
Data Range:	0 to 3	Operational Range: same as data range
00 - Accelerator pedal 1 not in low idle condition		
01 - Accelerator pedal 1 in low idle condition		
10 - Error		
11 - Not available		

Environmental Validation (Refer to Williams Spec WDS-010)

CURTISS-WRIGHT	PROCEDURE NAME:	DEPT:	030
	Williams Customer Specification Form		

DOCUMENT NUMBER:	WQF-030-021	REVISION LEVEL:	G	DATE EFFECTIVE:	06-13-2016	DAF#	396
Process Owner	Engineering				Department Manager	Head of Engineering	

Thermal Cycle	SAE J1455 -40°C to +85°C
Thermal Stress	SAE J1455 -40°C to +85°C
Thermal Shock	-40°C to +85°C
Humidity	120 hour exposure at 90±5% humidity from +27°C to +75°C
Mechanical Vibration	Random broadband 5-500 Hz, 4.0 G's
Mechanical Shock	SAE J1455 One meter drop to concrete with additional harness drop test
Salt Fog	ASTM B-117 96 hr exposure
Dust Exposure	24 Hr exposure, pedals cycled
Chemical Exposure	Diesel Fuel, Brake Fluid, Antifreeze Solution, Armor All®, De-Icer, and Diesel Exhaust Fluid
EMI Resistance:	**Refer to SAE J1113-1**

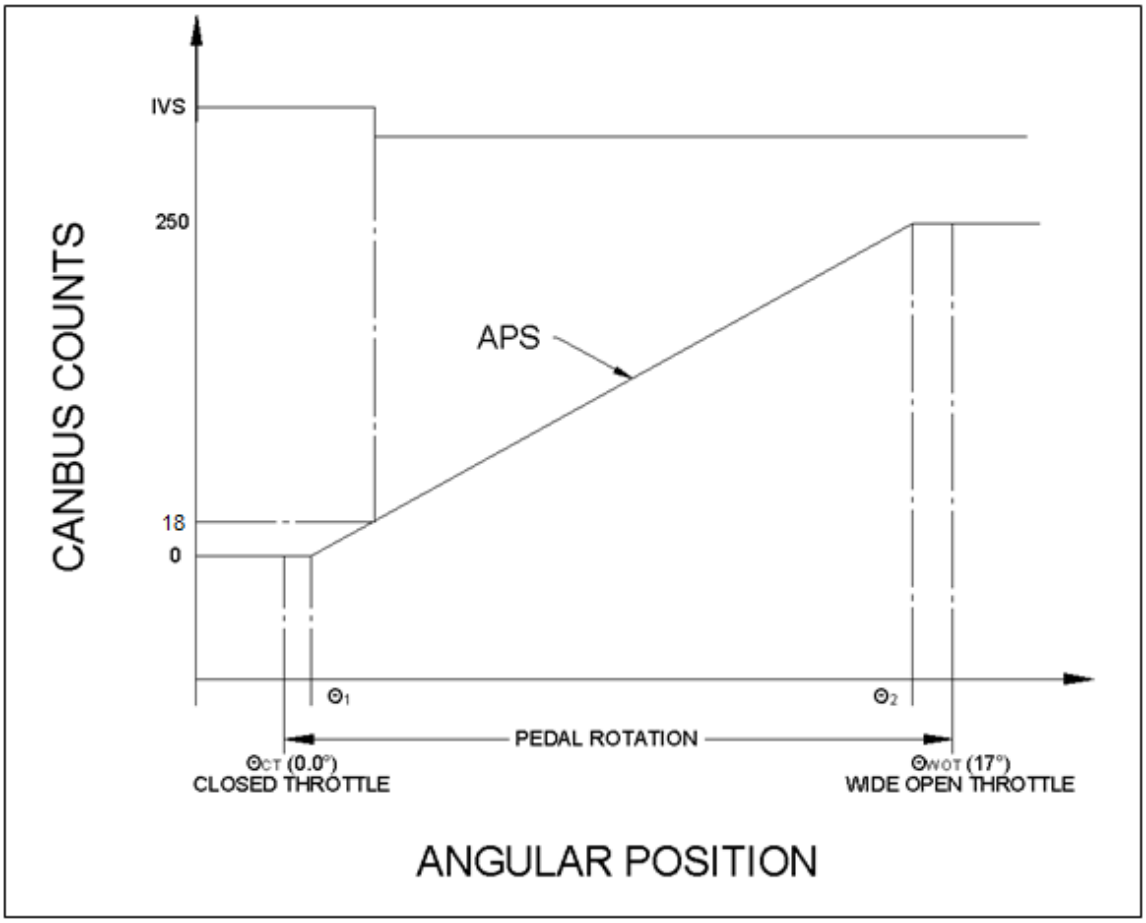
Regulatory Validation

FMVSS-124 RTI Certification	Per Federal regulations
FMVSS-302 Flammability	Per Federal regulations

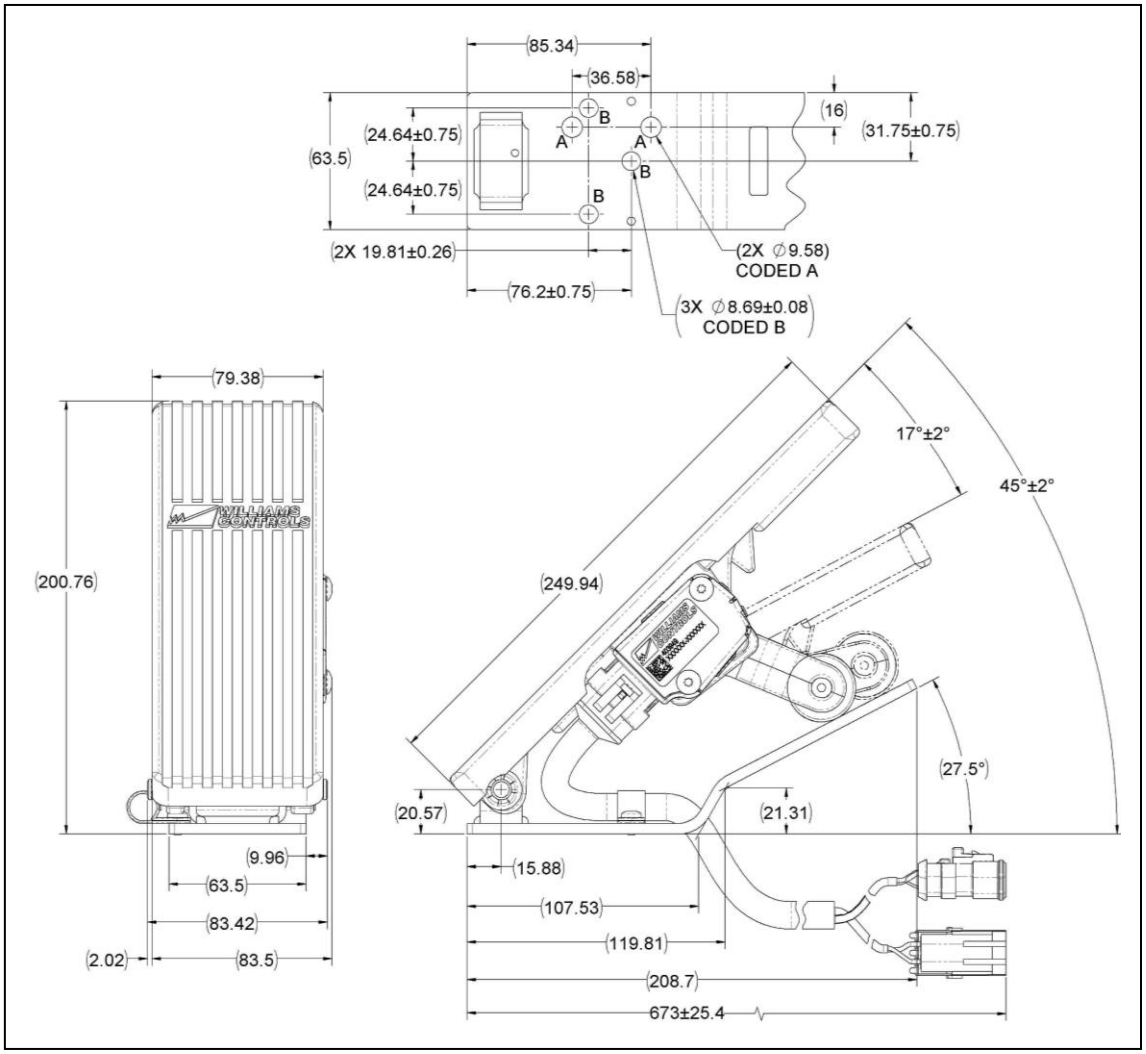
Mechanical Validation

Full Stroke Cycles:	3 million
Cycle Rate:	1 Hz

Typical Output Characteristics [KPC]



Mechanical Dimensions and Characteristics (for reference only)

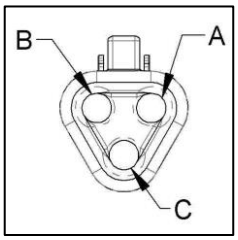


Dimensions in millimeters

Connector Pin Configuration:

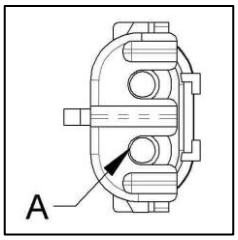
- Connector B: TE Connectivity
  - Deutsch 3-pin connector --- P/N DT06-3S-E008
  - Wedge lock ---------- P/N W3S
  - Terminal ---------- P/N 1062-16-0144

Pin	Function
A	CANH
B	CANL
C	Drain Wire



- Connector C : Aptiv “Weather Pack”
  - 2 Pin connector housing ---------- P/N 12010973
  - Seal ---------- P/N 12015899
  - Terminal ---------- P/N 12124582

Pin	Function
A	VBAT
B	GND



Referenced Documents:

- Williams Controls drawing
- Williams Controls Specification WDS-010
- SAE J1113-1 – Electromagnetic Compatibility Measurement Procedures and Limits for Components of Vehicles, Boats, and Machines
- Troubleshooting Guidelines – NovaBus (DM1 Diagnostic info)

Proprietary and Confidential:

Revision History

Rev	Date	ECN#	Changes/Comments
A	5/6/2020	019852	Initial Alpha Release