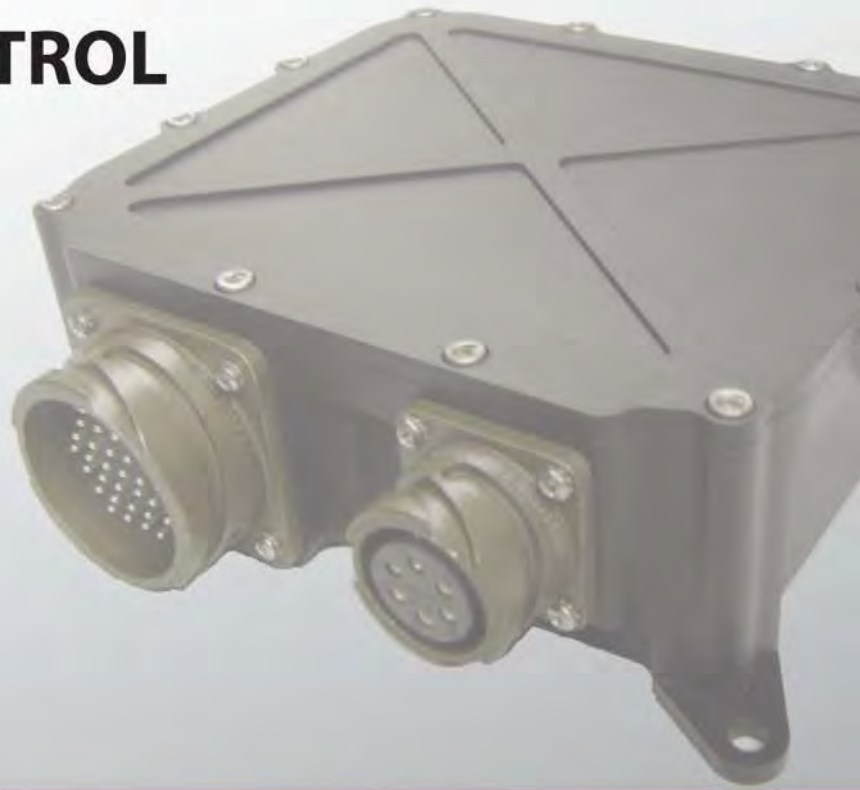




**POWERTRAIN CONTROL
SOLUTIONS**



TRANSMISSION CONTROL

Original Equipment Products



TCM-2200



The TCM-2200 is our most robust, rugged, and smallest transmission control module. This controller was designed for vehicles where space and weight are at a premium. The TCM-2200 is sealed to an IP69K ingress protection level which enables the OEM to package the module directly on the transmission below the fording line of the vehicle.

- 3 Frequency inputs, 10 general purpose inputs, and 8 outputs. Four of the outputs provide current monitoring for closed loop current control.
- Complies with MIL-STD 461F, ASTM B117 (1000 hr. salt spray) and IP69K ingress protection. Other certifications available at request.
- Available in black anodize, black CARC, or green CARC finish.
- Optionally, the standard 35-pin plastic connector can be upgraded to a 36-pin black anodize or olive green cadmium plated connector. Both connector options are certified to the same standards and meet the equivalent level of ingress protection.

Installation on the transmission greatly reduces wire harness complexity, weight, and cost. This also provides the ability to ship transmission or powertrain packages complete with the controller and harness already installed. Installation into a vehicle would only require installing the transmission, and connecting the vehicle interface connector – no complicated harness to run in and out of the cabin. TCM to transmission mounting brackets are available for some transmissions. PCS can assist in designing a bracket for a specific application.



Versatile Communication. Simple Integration.

All PCS TCM's include a CAN 2.0B bus interface that can be configured up to 1.0Mbps and currently supports J1939. The TCM-2200 contains 2 CAN interfaces. Proprietary communication protocols can be implemented for seamless vehicle integration. All PCS TCM's are also equipped with one RS-232 interface. The TCM-2100 and TCM-2200 additionally include one GM ALDL interface. All of these different interfaces can be used for calibration, diagnostics, production line use, and much more. Windows based calibration software is included.



Commonly Supported Transmissions - Please contact PCS with requests for other transmissions

GM	4L40E, 4L60E, 4L65E, 4L70E, 4L80E, 4L85E, 5L40E
Ford	AODE, 4R70W, 4R100, E4OD, 5R55S/W, 5R55N, 5R55E
Chrysler	41TE, 42RLE, 42LE, 45/545RFE
ZF	4HP14, 4HP18, 4HP20, 4HP22, 4HP24, 5HP18, 5HP19, 5HP24, 5HP30

TCM-2005



Designed for rugged environments, this black anodized, billet aluminum TCM features a mil-spec connector and a separate on-board mil-spec diagnostic connector, eliminating the need for additional wiring to a remote mounted diagnostic connector. The TCM-2005 is fully sealed to IP67 standards.

- 4 Frequency inputs, 15 general purpose inputs, and 11 outputs
- Environmental and EMI certifications available at request
- Black anodize finish

TCM-2006



The TCM-2006 contains the most I/O of all PCS TCM's. With all of its versatility, the TCM-2006 is often considered more of an engineer's toolkit than a dedicated transmission controller. We often recommend the TCM-2006 to be used for initial development. Once we help you determine which I/O is required for production, we can then help determine the most cost effective transmission controller that will meet your requirements. Since all PCS TCM's share the same control architecture, switching a calibration from one model TCM to another is a simple task. The amount of I/O on the TCM-2006 is also valuable to customers such as transmission dyno manufacturers, who need to support several different transmissions with the same controller. Changing the configuration takes seconds using the Windows software.





- 4 Frequency inputs, 22 general purpose inputs, and 12 outputs
- Optional upgrade to current monitoring on all 12 outputs (TCM-2008)
- Black anodize finish

TCM-2100



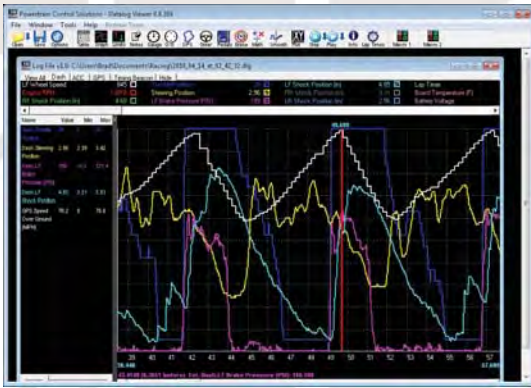
The TCM-2100 is targeted for a vehicle that does not require the TCM to be sealed against water ingress. The extruded aluminum case and automotive style connector can be mounted in a dry location or placed into a sealed enclosure if necessary.

- 3 Frequency inputs, 8 general purpose inputs, and 8 outputs. One of the outputs provides current monitoring for closed loop current control.
- Complies with MIL-STD 461D. Other certifications available at request.
- Available in black anodize, or natural finish.

All PCS TCM's are:	TCM-2005	TCM-2006	TCM-2200	TCM-2100
<ul style="list-style-type: none"> Manufactured at our ISO 9001 Facility 1-Year Warranty (parts and labor) Factory Tested and Burned In 				
Physical				
Weight	2.94 lbs.	2.86 lbs.	0.64 lbs.	0.87 lbs.
Dimensions (L x W x H inches)	7.25 x 7.3 x 2.25	7.25 x 7.3 x 2.25	5.3 x 3.7 x 0.675	5 x 6.125 x 1.5
Case Material & Finish	Aluminum Black Anodize	Aluminum Black Anodize	Aluminum Black Anodize or CARC	Extruded Aluminum
Operating Conditions				
Voltage Range	8 – 18 VDC standard. 24 VDC models available as an option.			
Current (device only, not including outputs)	On: 100 mA Quiescent: 0 mA	On: 100 mA Quiescent: 0 mA	On: 100 mA Quiescent: 9 mA	On: 100 mA Quiescent: 9 mA
Operating Temperature	-40 to 125°C	-40 to 125°C	-50 to 125°C	-50 to 125°C
Storage Temperature	-40 to 125°C	-40 to 125°C	-55 to 125°C	-55 to 125°C
Reverse/Transient Protections	Yes	Yes	Yes	Yes
Ingress Protection	IP67	IP61	IP69K	IP50
Harness Interface	37-pin Mil spec 6-pin Mil spec	37-pin CPC 16-pin CPC	35-pin Sealed CPC Optional 36-pin	Delphi 56-pin
EMI Immunity	All modules are designed for robust EMI immunity. PCS offers certification testing for the desired controller/transmission package as a cost option.		Currently certified for MIL-STD 461. Certification for other standards available as a cost option.	
Communication				
CAN 2.0b	1	1	2	1
RS-232	1	1	1	1
Real-time tuning and data logging with a PC	Yes	Yes	Yes	Yes
Real-time tuning and data logging with PCS handheld touchscreen interface	Yes	Yes	Yes	Yes
In-Field Flash Upgradeable	Yes	Yes	Yes	Yes
PCS Native Communication	Yes	Yes	Yes	Yes
GM ALDL	No	No	Yes	Yes
Inputs				
Frequency (Range 0 – 10 kHz)	4	4	3	3
Programmable Trigger Levels and Filtering for Frequency Inputs	Yes	Yes	2 Channels	2 Channels
Analog Voltage (0-5VDC)	4 total 2 with 1kΩ 5V pull-ups	6 total 2 with 1kΩ 5V pull-ups	2 total 1 with 1kΩ 5V pull-up	2 total 1 with 1kΩ 5V pull-up
Programmable Input Parameters	Yes	Yes	Yes	Yes
Failure Diagnostics for each Analog Input	Yes	Yes	Yes	Yes
Digital (programmable active high or low)	11	16	8 (9 optionally)	6
Overvoltage Protection for Each Input	Yes	Yes	Yes	Yes
Outputs				
PWM	9	9	7	7
Digital	2	3	1	1
PWM & Digital Maximum Current	3.5 Amp	3.5 Amp	3.5 Amp	3.5 Amp
Short Circuit, Overcurrent & Thermal Protection	Yes	Yes	Yes	Yes
User Selectable Output Drive Type (Battery Voltage or Ground)	Yes	Yes	Ground Only	Ground Only
Programmable Output Type/Parameter for PWM and Digital Outputs	Yes	Yes	Yes	Yes
Output Channel Current Monitoring	No	No	4 PWM Channels 0 - 2 Amp	1 Dedicated high-side measured output

TCM Diagnostics

All PCS TCM's constantly monitor transmission performance to detect if a problem has occurred. Depending on the failure, the TCM can command the transmission into a limp mode to potentially prevent further damage while allowing the vehicle to move. The TCM can signal an issue to the driver by activating an indicator light on the instrument cluster.



To further diagnose the problem diagnostic trouble codes can be signaled through a flashing light.

Alternatively, trouble codes can be read using the PCS TCM Diagnostic Tool (Model TDT-2000), most scan tools, or a laptop with PCS software. Both the software and TDT-2000 allow the user to view and data log transmission parameters, such as current gear, TPS %, engine RPM, etc, to help troubleshoot the most difficult intermittent issues.



TDT-2000

Wire Harness Manufacturing



PCS offers full wire harness manufacturing capability. Our wiring department can provide quick-turn prototypes or full production volume harnesses to support your needs. Common automotive colors and gauges of TXL wire are maintained in stock. All wire is machine cut and stripped.



State-of-the-art crimp machines provide consistent, high-quality crimps. All harnesses are 100% electrically tested (both continuity and load). We can also provide over-molded harnesses, which are standard for the TCM-2200. Contact us for all of your wire harness needs from prototype to production.

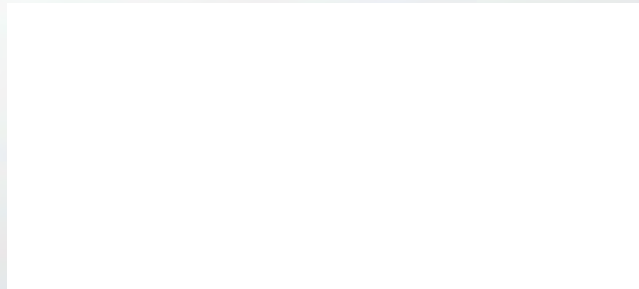
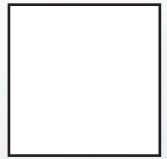
About Us

Powertrain Control Solutions currently designs, manufactures, and delivers embedded control systems for both prototype and production military, industrial, and commercial OEM vehicles. Our staff combines over 50 years of electronic design and manufacturing experience.

With 100% of the design work done in-house, our customers appreciate our thorough understanding of the product and quick responsiveness to meet new requirements. PCS can deliver thorough documentation including FMEA and PPAP information to meet the most stringent approval processes. We can also perform EMI and environmental testing to meet requirements such as MIL-STD 461. In addition, PCS can arrange for 24-hr, 7-days a week on-site engineering to support your needs from proof-of-concept to production line integration. We look forward to proving our commitment to excellence each time you purchase a PCS product.



POWERTRAIN CONTROL SOLUTIONS LLC
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LIMITED WARRANTY STATEMENT. Powertrain Control Solutions, LLC. Warrants all merchandise against defects in factory workmanship and materials for a period of 12 months after purchase. This warranty applies to the first retail purchaser and covers only those products exposed to normal use or service. Provisions of this warranty shall not apply to a Powertrain Control Solutions, LLC. Product used for a purpose for which it is not designed, or which has been altered in any way that would be detrimental to the performance or life of the product, or misapplication, misuse, negligence or accident. On any part or product found to be defective after examination by Powertrain Control Solutions, LLC., Powertrain Control Solutions, LLC. will only repair or replace the merchandise through the original selling dealer or on a direct basis. Powertrain Control Solutions, LLC. assumes no responsibility for diagnosis, removal and/or installation labor, loss of vehicle use, loss of time, inconvenience or any other consequential expenses. The warranties herein are in lieu of any other expressed or implied warranties, including any implied warranty of merchantability or fitness, and any other obligation on the part of Powertrain Control Solutions, LLC., or selling dealer.

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