MotoHawk Control Solutions

ECM-0563-048-0704-C/F

Engine Control Modules

(Part Nos. 1751-6527 / 1751-6410)

- **Microprocessor**: Freescale MPC563, 56 MHz
- **Memory**: 512K Flash, 32K RAM (24K+4K overlayable), 128K parallel EEPROM (ECM-0563-048-0704-C)
- **Operating Voltage**: 8–16 Vdc
- **Operating Temperature**: –40 to +105 °C
- Sealed connectors operable to 10 ft (3 m) submerged
- **Inputs:**
  13 Analog
  2 VR/Hall Frequency
- **Outputs:**
  4x Low Side Injector Drivers
  8x TTL Level Ignition System
  7x High Current Low Side PWM
  1x 5 A H-Bridge PWM with Current Feedback
  Independent Transducer Power Supply
  1x Low Side Relay Driver (Main Power)
- **Datalinks:**
  1 CAN 2.0B Channel

Description

Presenting the ECM-0563-048-0704-C/F engine control modules from Woodward's new MotoHawk Control Solutions product line. These rugged embedded controllers are capable of operating in harsh automotive, marine, and off-highway applications. Over 300,000 successful marine applications prove the capability of this module. Based on a proven microprocessor, the ECM-0563-048-0704-C/F modules are capable of delivering complex control strategies. The onboard floating point unit and the high clock frequency allow software to be developed in shorter times. Dual CAN 2.0B datalinks ensure interoperability with other system components.

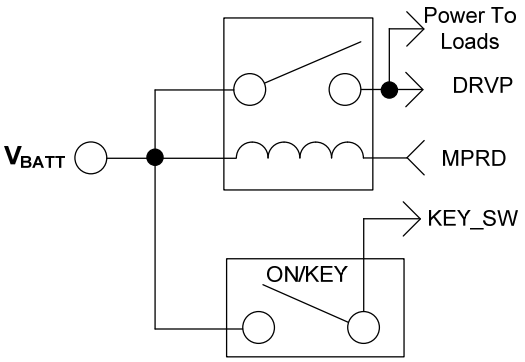
The ECM-0563-048-0704-C/F modules are part of the ControlCore® family of embedded control systems. MotoHawk Control Solutions' ControlCore operating system, MotoHawk® code-generation product, and MotoHawk's suite of development tools enable rapid development of complex control systems.

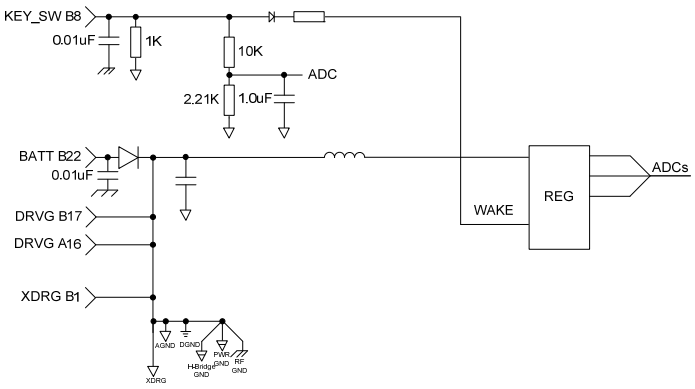
IMPORTANT **Woodward does not warranty these ECMs based on information supplied in this datasheet, but only with an express and specific production supply agreement based on customer's operating mode. Information in this datasheet is subject to change without prior notice. Please contact MotoHawk Control Solutions sales for more information.**

1–Input Signal Conditioning

1.1 BATT (B22), KEY_SW (B8), GND (A16, B17), XDRG (B1), DRVP (A23)

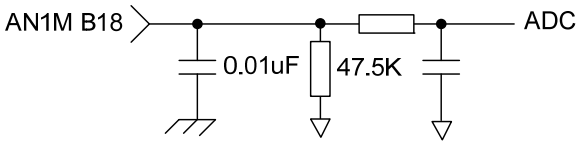
KEY_SW supplies module power on (Enable) signal, this input is monitored by the processor. DRVP is the source for the H-Bridges; it is monitored by the processor.





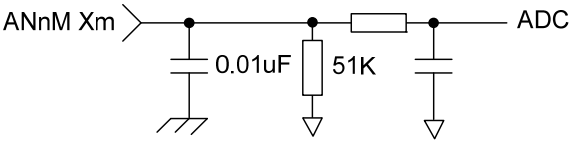
1.2 AN1M, AN2M (B18, B23)

This input is a 10-bit 0–5 V ADC, τ = 1 ms.



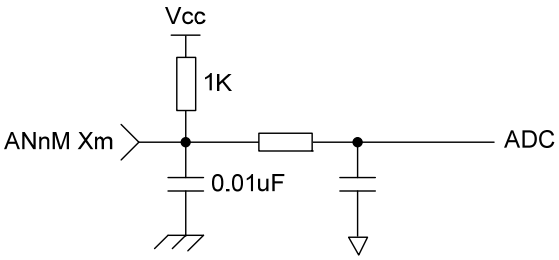
1.3 AN3M, AN4M (B4, B7)

These inputs are 10-bit 0–5 V ADCs, τ = 1 ms.



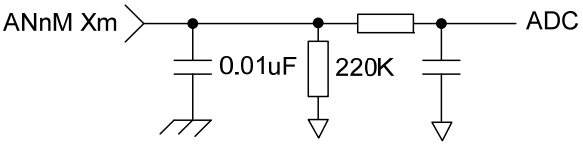
1.4 AN5M (B16)

This input is a 10-bit 0–5 V ADC, τ = 1 ms.



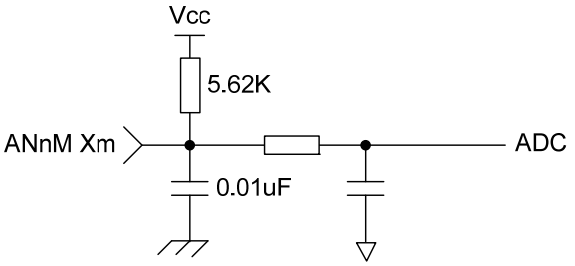
1.5 AN6M, AN7M (B2, B3)

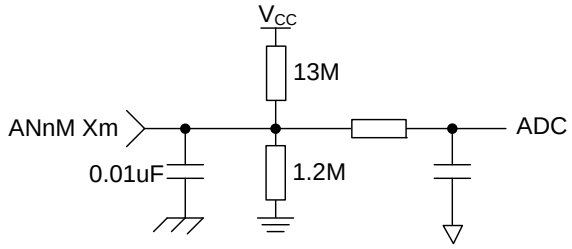
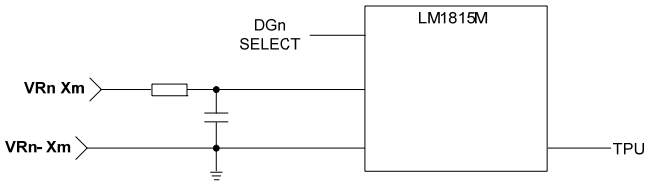
These inputs are 10-bit 0–5 V ADCs, τ = 1 ms.

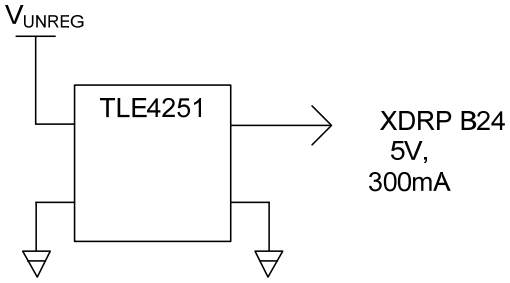
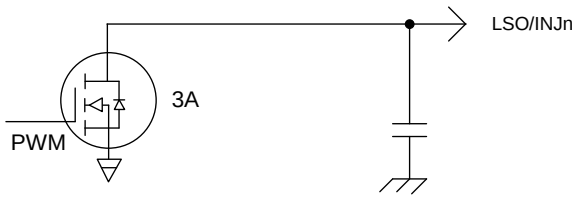
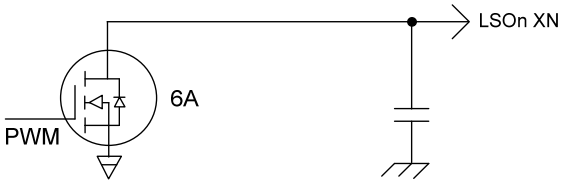
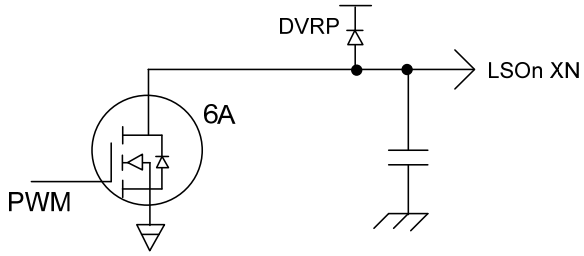


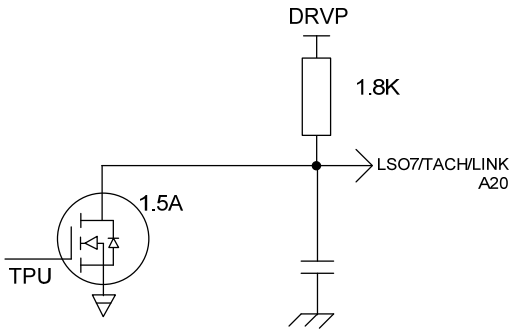
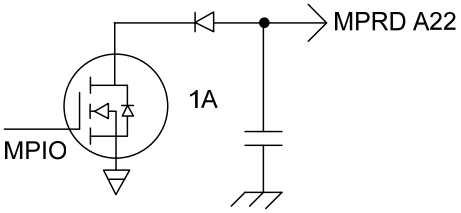
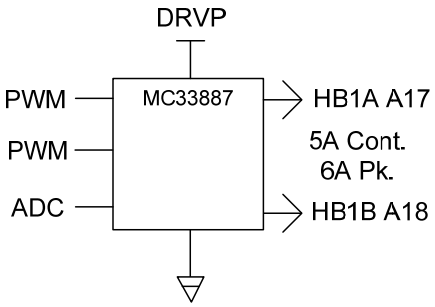
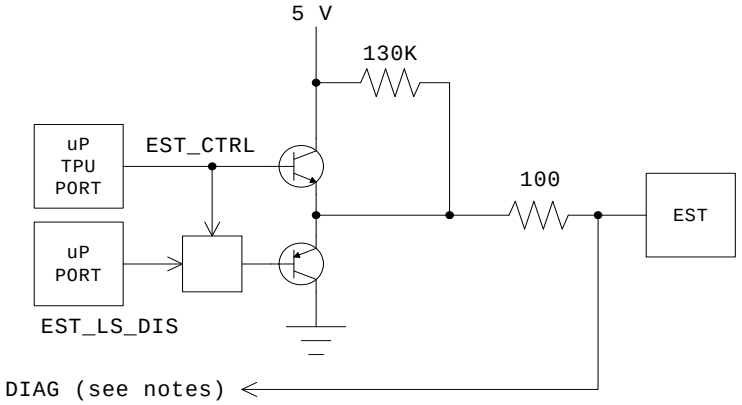
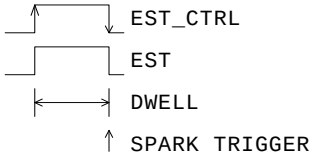
1.6 AN8M,..., AN10M (B12, B15, B14)

These inputs are 10-bit 0–5 V ADCs, τ =1 ms.



1–Input Signal Conditioning	(continued)
1.7 AN11M,..., AN13M **(B13, B19, B9)** These inputs are 10-bit 0–5 V ADCs, τ =1 ms. These inputs are suitable for EGO sensors.	
1.8 VR1+, VR1-, VR2+, VR2- **(B5, B6, B10, B11)** VR1 and VR2 are variable reluctance sensor inputs. Hall Effect sensors may also be used (B6 and B11 left open).	

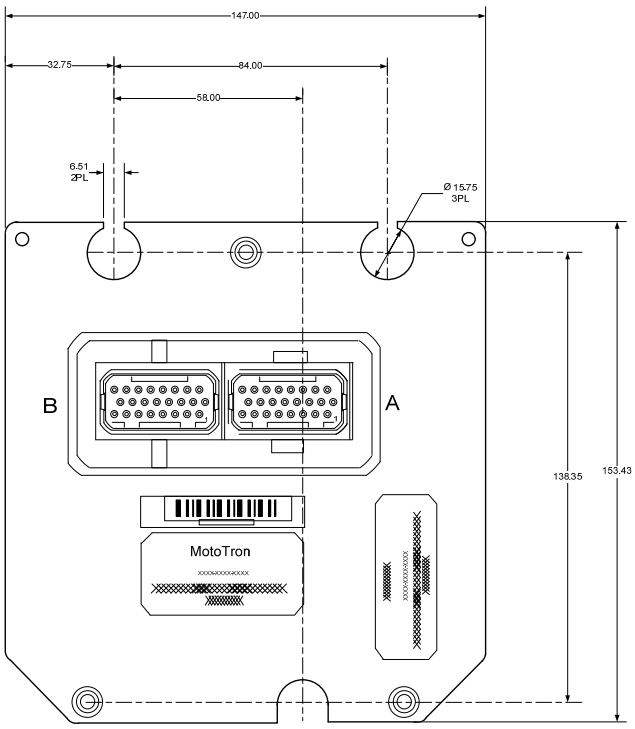
2–Output Signal Conditioning	
2.1 XDRP **(B24)** XDRP is the transducer power source. It is monitored by the processor.	
2.2 LSO/INJ1,..., LSO/INJ4 **(A5, A8, A4, A7)** These outputs are high current sink drivers, 3 A max. Short circuit protection, open circuit and short circuit detection.	
2.3 LSO5, LSO6, LSO8, LSO9 **(A13, A14, A11, A24)** These outputs are high current sink drivers, 6 A max. Short circuit protection, open circuit and short circuit detection.	
2.4 LSO10, LSO11 **(A2, A1)** These outputs are high current sink drivers, 6 A max. Short-circuit protection, open-circuit and short-circuit detection, with recirc diode.	

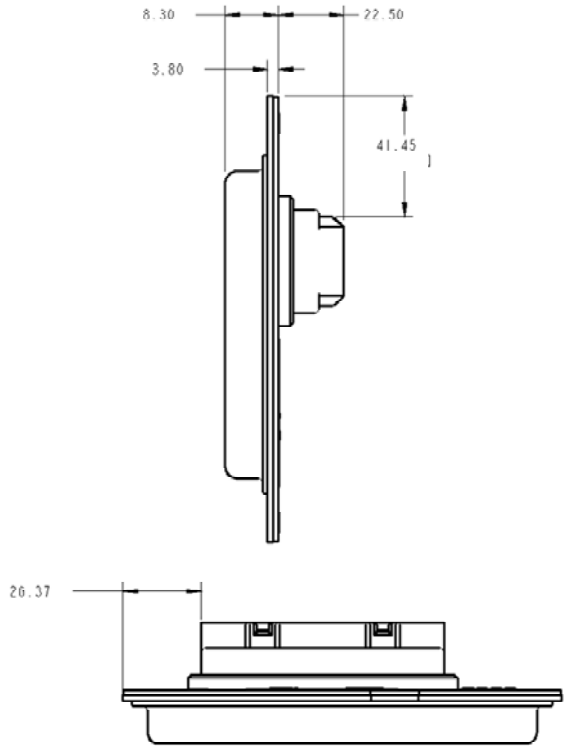
2–Output Signal Conditioning	(continued)
2.5 LSO7/TACH/LINK **(A20)** This output is capable of sinking 1.5 A max. It may also be used as a Tachometer output or a Serial Data Link. Short circuit protection, open circuit and short circuit detection.	
2.6 MPRD **(A22)** This output energizes the Main Power Relay. Short circuit protection, open circuit and short circuit detection.	
2.7 HB1A, HB1B **(A17, A18)** This is a 12 volt H-bridge output. 5 A cont., 6 A peak, with current feedback.	
2.8 EST1,..., EST8 **(A9, A10, A3, A6, A19, A21, A12, A15)** These are TTL level outputs. May be used as an analog input with a 130K pull up when not used for spark.	 

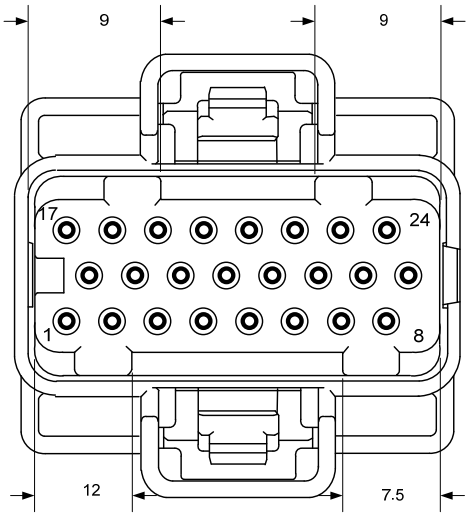
3–Communications	
3.1 CAN1+, CAN1- **(B20, B21)**	CAN 2.0B, Standard or Extended ID, up to 1 MBd.
3.2 LINK **(A20)** (See 2.5)	EasyLink Gauge Interface

4–Connector Definitions

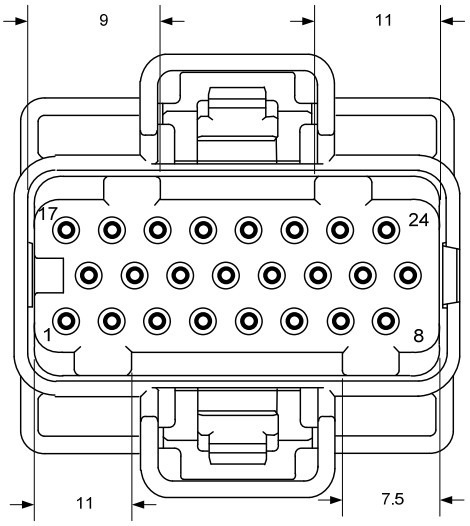
(All dimensions are in millimeters.)







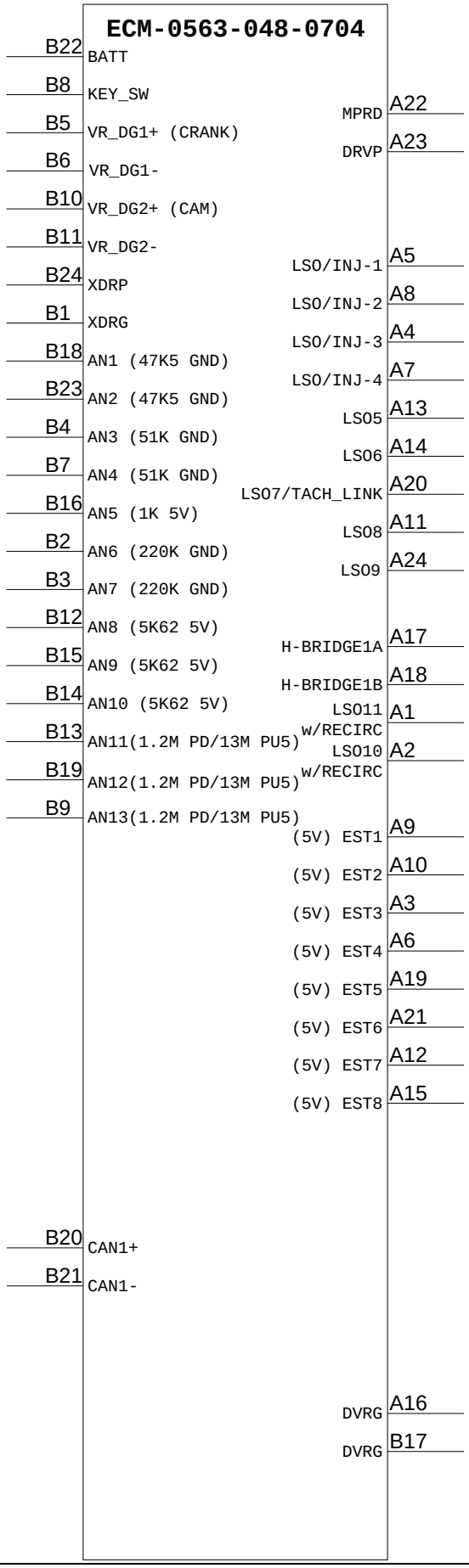
CON-FEML-001A
A



CON-FEML-001B
B

4.1 Block Diagram

ECM-0563-048-0704-C/F



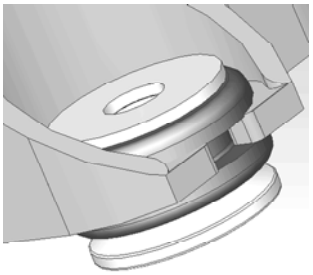
4.2 Connector Pinouts			4.2.1 Resource by Connector Pin P/N: HARN-XXX-NNN-D0	
Pin # ECM	**ControlCore Resource Name**	**Function Name**	**Notes**	**Wire Number Color Code**
A1	LSO11	Low Side Output w/recirc.	6 A	1 Pink/Light Blue
A2	LSO10	Low Side Output w/recirc.	6 A	2 Pink/Orange
A3	EST3	Electronic Spark Timing/Analog Input	TTL Level	3 Yellow/Black
A4	LSO3/INJ3	Low Side Injector Output	3 A	4 White
A5	LSO1/INJ1	Low Side Injector Output	3 A	5 White/ Dark Blue
A6	EST4	Electronic Spark Timing/Analog Input	TTL Level	6 Black/Red
A7	LSO4/INJ4	Low Side Injector Output	3 A	7 Yellow/Orange
A8	LSO2/INJ2	Low Side Injector Output	3 A	8 Light Blue
A9	EST1/AN14M	Electronic Spark Timing/Analog Input	TTL Level	9 Tan/Light Blue
A10	EST2/AN15M			10 Gray
A11	LSO8	Low Side Output	6 A	11 Dark Blue
A12	EST7	Electronic Spark Timing/Analog Input	TTL Level	12 Dark Blue/White
A13	LSO5	Low Side Output	6 A	13 White/Light Blue
A14	LSO6	Low Side Output	6 A	14 White/Black
A15	EST8	Electronic Spark Timing/Analog Input	TTL Level	15 Black/Yellow
A16	DVRG	System Ground		16 Black/White
A17	HB1A	H-Bridge1	5 A	17 Pink/Purple
A18	HB1B	H-Bridge1	5 A	18 Pink/Brown
A19	EST5	Electronic Spark Timing/Analog Input	TTL Level	19 Orange
A20	LSO7/TACH/LINK	Low Side Output w/PU		20 Orange/White
A21	EST6	Electronic Spark Timing/Analog Input	TTL Level	21 Black/Blue
A22	MPRD	Relay Driver	Supplies DRVP to Module via Relay	22 Yellow/Purple
A23	DRVP	H-Bridge Driver Power		23 Red/Blue
A24	LSO9	Low Side Output	6 A	24 Black/White

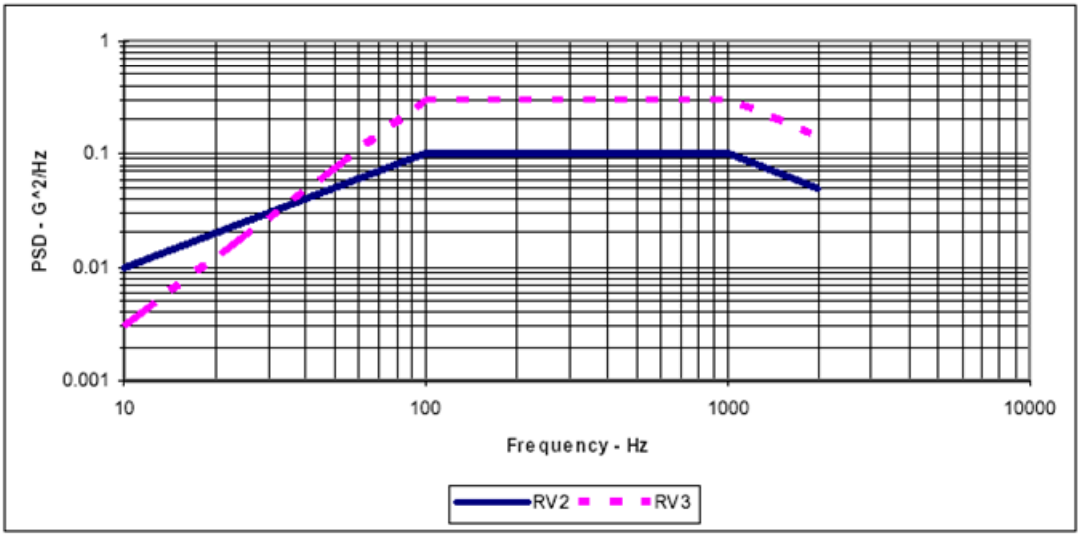
4.2 Connector Pinouts			4.2.1 Resource by Connector Pin (continued)	
Pin # ECM	**ControlCore Resource Name**	**Function Name**	**Notes**	**Wire Number Color Code**
B1	XDRG	Transducer Ground		25 Black/Orange
B2	AN6M	Analog Input	220K to GND	26 Tan
B3	AN7M	Analog Input	220K to GND	27 Yellow
B4	AN3M	Analog Input	51K to GND	28 Dark Blue/Pink
B5	VR1+/DG1	VR/Hall/Switch Input	LM1815	29 Red/Pink
B6	VR1-	VR Sensor Return		30 White
B7	AN4M	Analog Input	51K to GND	31 White/Green
B8	KEY_SW	Key Switch Input		32 Brown/White
B9	AN13M	Analog Input	13M to 5 V, 1.2M to GND	33 Gray/Red
B10	VR2+/DG2	VR/Hall/Switch Input	LM1815	34 Orange/Black
B11	VR2-	VR Sensor Return		35 Blue/Black
B12	AN8M	Analog Input	5.62K to 5 V	36 White/Orange
B13	AN11M	Analog Input	13M to 5 V, 1.2M to GND	37 White/Yellow
B14	AN10M	Analog Input	5.62K to 5 V	38 Tan/Green
B15	AN9M	Analog Input	5.62K to 5 V	39 Green/Yellow
B16	AN5M	Analog Input	1K to 5 V	40 Green/Red
B17	DVRG	System Ground		41 Black/Green
B18	AN1M	Analog Input	47.5K to GND	42 Purple
B19	AN12M	Analog Input	13M to 5 V, 1.2M to GND	43 Tan/Purple
B20	CAN1+	CAN 2.0B		44 Light Blue/White
B21	CAN1-	CAN 2.0B		45 Purple/Yellow
B22	BATT	Module Battery Input		46 Black/ Orange
B23	AN2M	Analog Input	47.5K to GND	47 Green/ Black
B24	XDRP	Transducer Power	5 V, 300 mA	48 Green/Blue

5–Environmental	
5.1 General	The ECM is designed to meet automotive industry standard under-hood environmental requirements for 12 volt systems, and also meets marine industry environmental requirements. Validation tests include extreme operating temperatures (–40 to +105 °C), thermal shock, humidity, salt spray, salt fog, immersion, fluid resistance, mechanical shock, vibration, and EMC. It is the responsibility of the application engineer to ensure that the application does not exceed the demonstrated capabilities of the unit; vibration or thermal. It may be necessary to perform additional tests to validate the unit in the application.
5.2 Storage Temperature:	–40 to +125 °C
5.3 Operating Temperature:	–40 to +105 °C
5.4 Thermal Shock:	–40 to +125 °C air–air, 500 cycles, 6 minutes each point
5.5 Fluid Resistance:	Lubricating oil unleaded gasoline, long-life coolant, hydraulic fluid, transmission fluid
5.6 Humidity Resistance:	85% humidity at 85 °C for 1000 hours of operation
5.7 Salt Fog Resistance:	500 hours, 5%, 35 °C
5.8 Immersion:	Submersible in 8% salt water solution to 10 ft (3 m)
5.9 Mechanical Shock:	40 g peak, 3 planes, sawtooth
5.10 Drop:	1 m, 6 surfaces on concrete

5.11 Vibration:

Engine mountable and tested to high-performance levels, the ECM has been successfully deployed on engines having the vibration profiles shown at right: Electrical and mechanical isolation is via a bushing, grommet, and washer, as shown:





Freq	RV2	RV3
10	0.010	0.003
100	0.100	0.300
200	0.100	0.300
300	0.100	0.300
400	0.100	0.300
500	0.100	0.300
600	0.100	0.300
700	0.100	0.300
800	0.100	0.300
900	0.100	0.300
1000	0.100	0.300
2000	0.050	0.140

5–Environmental (continued)

5.12 Abnormal Supply Voltage Resistance:

Condition	Supplied Voltage	Time
Reverse Battery (main power relay installed)	–13.5 Vdc	5 minutes
Double Battery (at 23 °C)	24 Vdc	5 minutes
Minimum Battery	8 Vdc	Indef.
Low Battery Condition	6.3 Vdc	Indef.

6–Using a Boot Key/Cable

Errors in configuration, logic and/or other programming made during program development for this module (via .srz file), can cause a persistent loss of CAN communications with the module under development.

If this happens, apply the boot key to force the module into reboot mode, reloading the module with functional program code (a known, valid .srz file) in order to allow resumption of module communication. Follow the steps listed in this section.

Refer to diagram below for connections.

⚠WARNING Remove the ECU from direct control connections before performing the reboot procedure, as outputs are set to defaults or undefined states, with unpredictable and possibly hazardous results if applied.

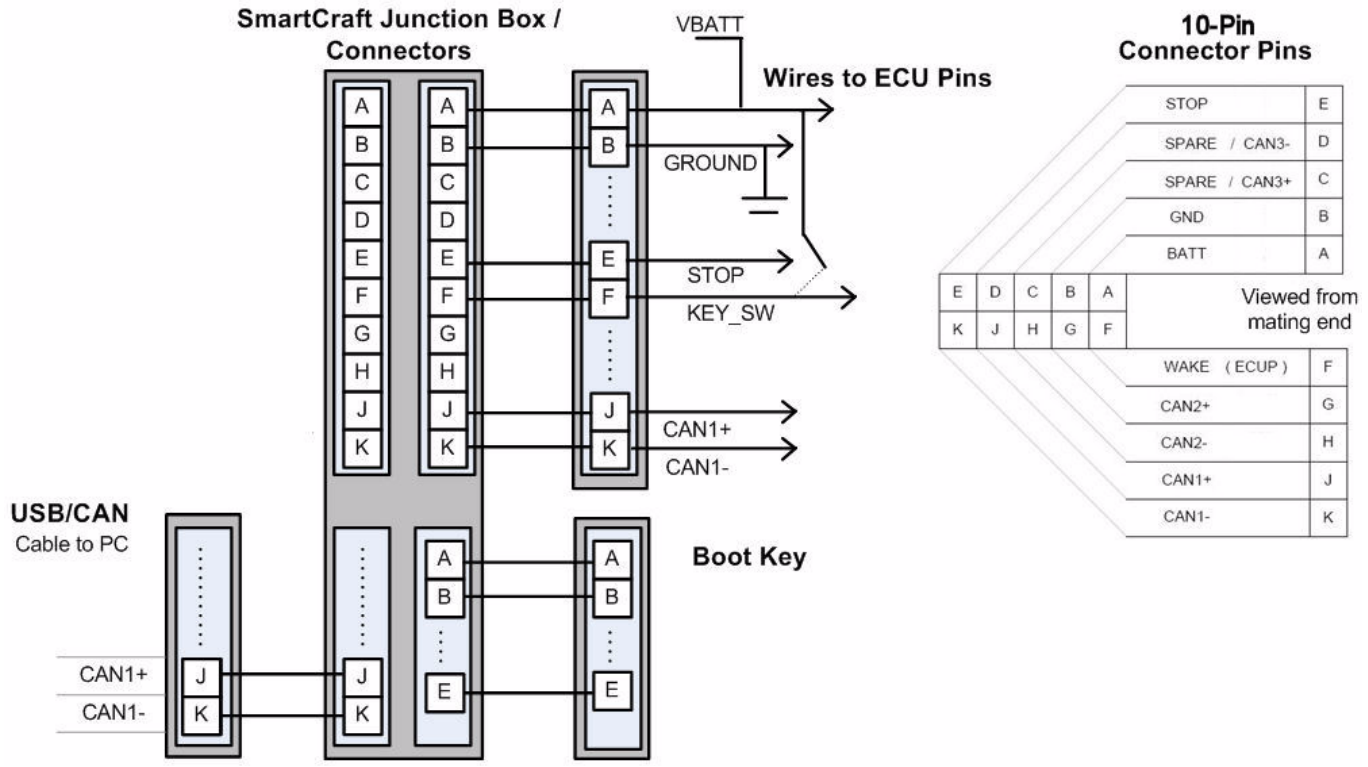
Use Boot Key and Reprogram the Module

NOTICE Remove other ECUs from CANbus for this procedure.

1. Connect the module for programming via necessary cables, CAN converter, etc.
2. Select a known, valid .srz file for programming.
3. With key off, disconnect battery power from module. With module power off, initiate programming of the module using MotoTune®.
4. When the “Looking for an ECU” prompt appears in the dialog, reconnect Battery, and then turn key on, to power up and “wake-up” ECU.

The module must “wake-up” (KEYSW on) with the boot key or cable connections applied as described in order to initiate a reboot and to absorb the selected program.

NOTE—A boot key provides a 555 Hz, 50% duty cycle, V=Vbatt, square wave signal to the STOP pin, which may be duplicated by applying this signal from a signal generator to that pin.



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For more information contact:

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