MotoHawk Control Solutions

ECM-0555-048

Family of General Control Modules — Calibratible / Flash

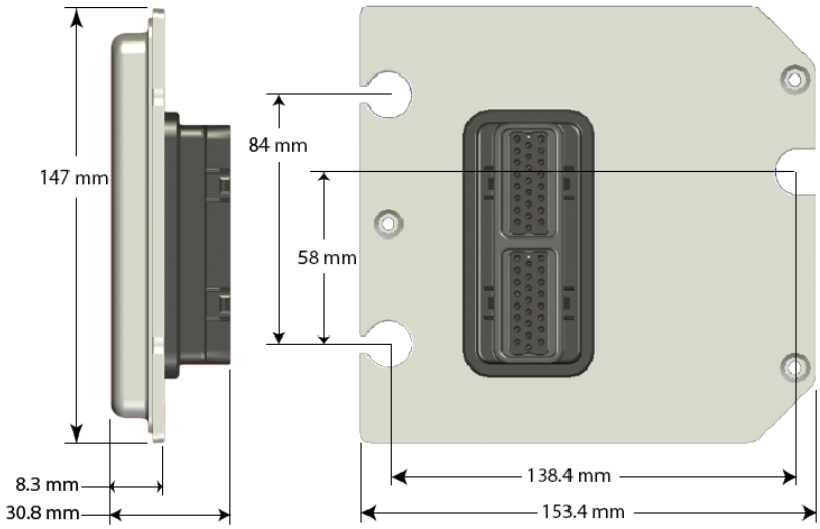
Description

Presenting the ECM-0555-048 family of engine control modules from Woodward's new MotoHawk Control Solutions product line. These rugged controllers are capable of operating in harsh automotive, marine, and off-highway applications. Numerous marine applications have proven the capability of this family. Based on the Freescale MPC555 family of microprocessors, the ECM-0555-048 is capable of delivering complex control strategies. The onboard floating-point unit and high clock frequency allow software to be executed in shorter times. The CAN 2.0B datalink ensures interoperability with other vehicle systems.

The ECM-0555-048 is part of the MotoHawk Control Solutions' ControlCore® line of embedded control systems. The ControlCore operating system, MotoHawk® code generation product, and MotoHawk's suite of development tools enable rapid development of complex control systems.

Each controller is available in 'F' (Flash) or 'C' (Calibratible) versions. Flash modules are typically used for production purposes. Calibratible modules are typically for prototyping/development only; they can be calibrated in real time using MotoTune®.

Physical Dimensions



- 48-pin platform, 5 different versions
- Microprocessor: Freescale MPC555, 40 MHz
- Memory: 448K Flash, 26K RAM, 4K serial EEPROM Flash, Exception: 0710 - 8K serial EEPROM
- Calibratible Memory: 64K parallel EEPROM
- Operating Voltage: 8–16 Vdc
- Operating Temperature: –40 to +85 °C (in benchmark marine engine application)
- Sealed Connectors Operable to 10 ft (3 m) submerged

Inputs:

- 12 to 15 Analog
- 3 or 4 Low Frequency Digital
- 1 or 2 Hall Effect Frequency (cam)
- 0 or 1 Variable Reluctance Frequency (crank)
- 0 to 2 Knock Sensor
- 1 Stop

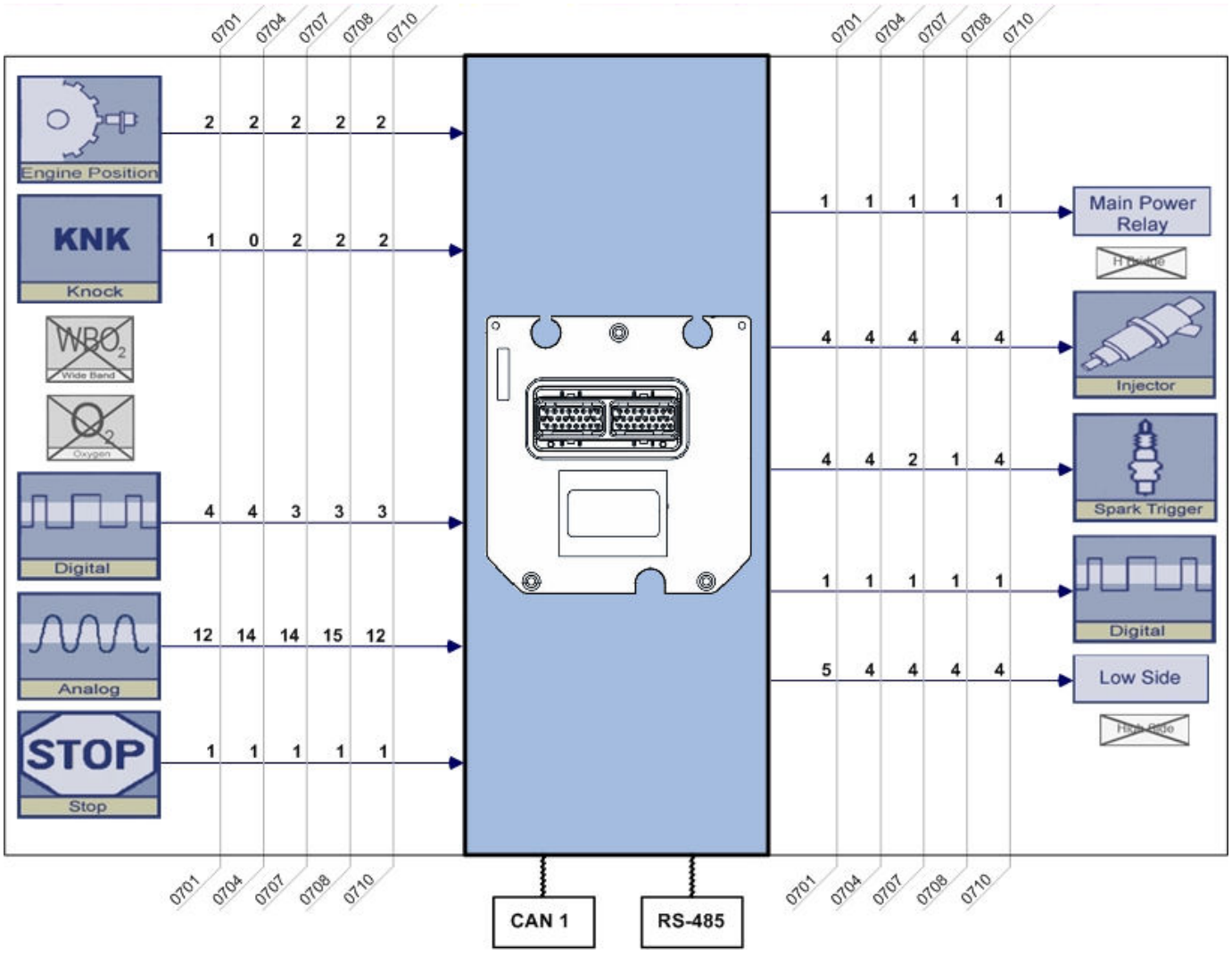
Outputs:

- 11 or 12 Low Side Driver
- 1 Digital
- 1 Main Power Relay Driver

Communications:

- 2 CAN 2.0B Channels

Simple Block Diagram

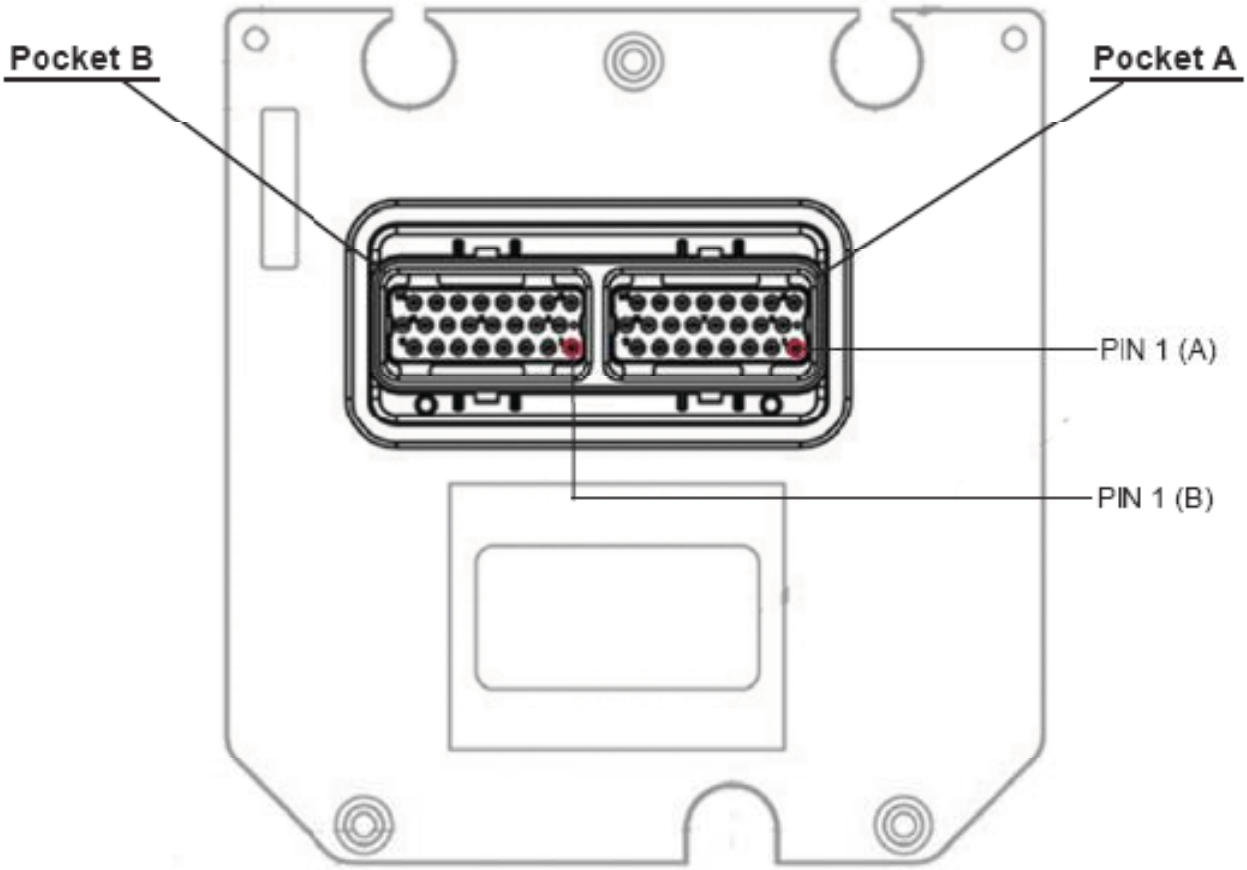


Ordering Information

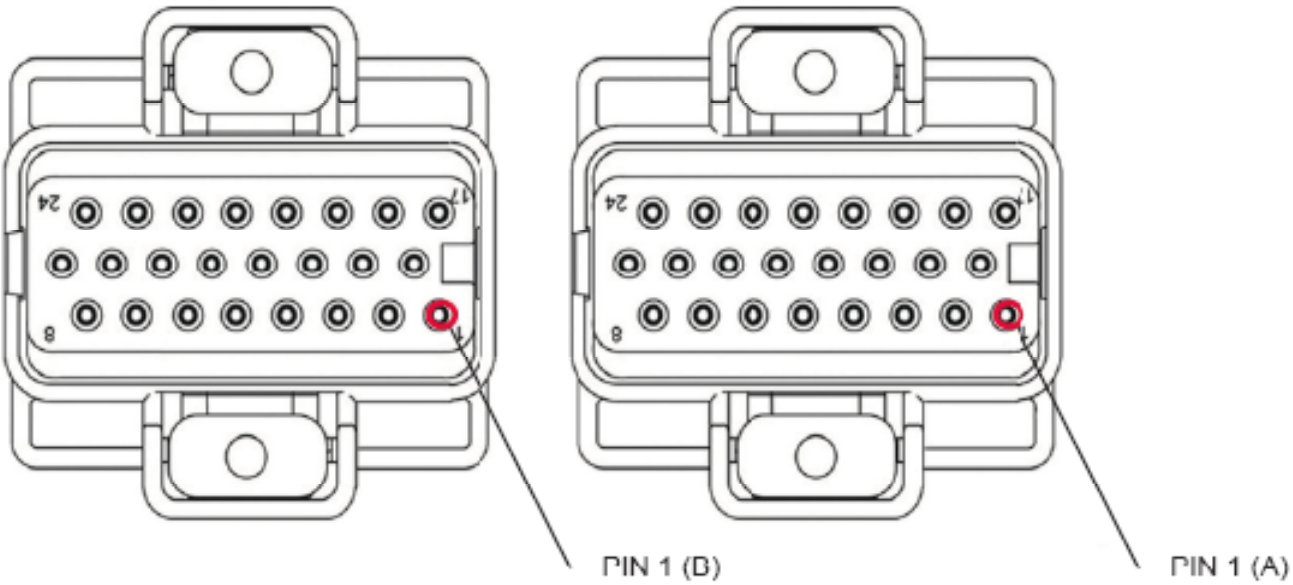
Controller	Part No.	Boot Key (P/N)	Boot Cable	Desktop Simulator Harness (P/N)
ECM05550480701CP0	1751-6530	HARNINTR00801 (1635-1800)	N/A	HARNINTR024A (5404-1203)
ECM05550480701F00	1751-6385			
ECM05550480704CP0	1751-6504			
ECM05550480704F00	1751-6387			
ECM05550480707CP0	1751-6505			
ECM05550480707F00	1751-6389			
ECM05550480708CP0	1751-6531			
ECM05550480708F00	1751-6391			
ECM055504807010CP0	1751-6513			
ECM055504807010F00	1751-6393			

CP0 suffix indicates calibratible (development) version of a module.

Connector/Pocket Definitions



Connectors viewed from wire insertion side



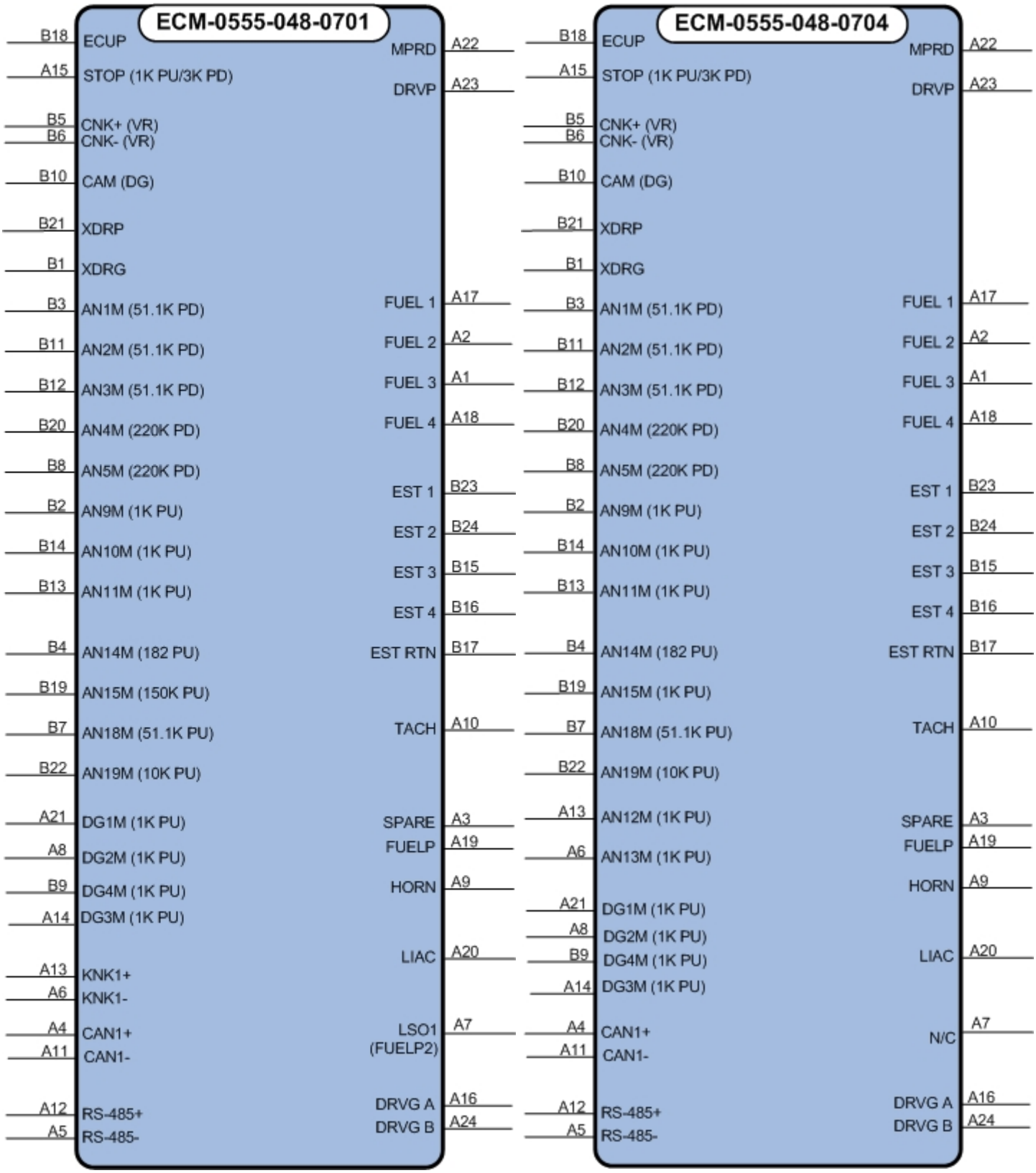
Connector B
MotoTron P/N: CON-FEML-001B
TYCO P/N: 4-1437287-6

Woodward P/N: 1635-1727

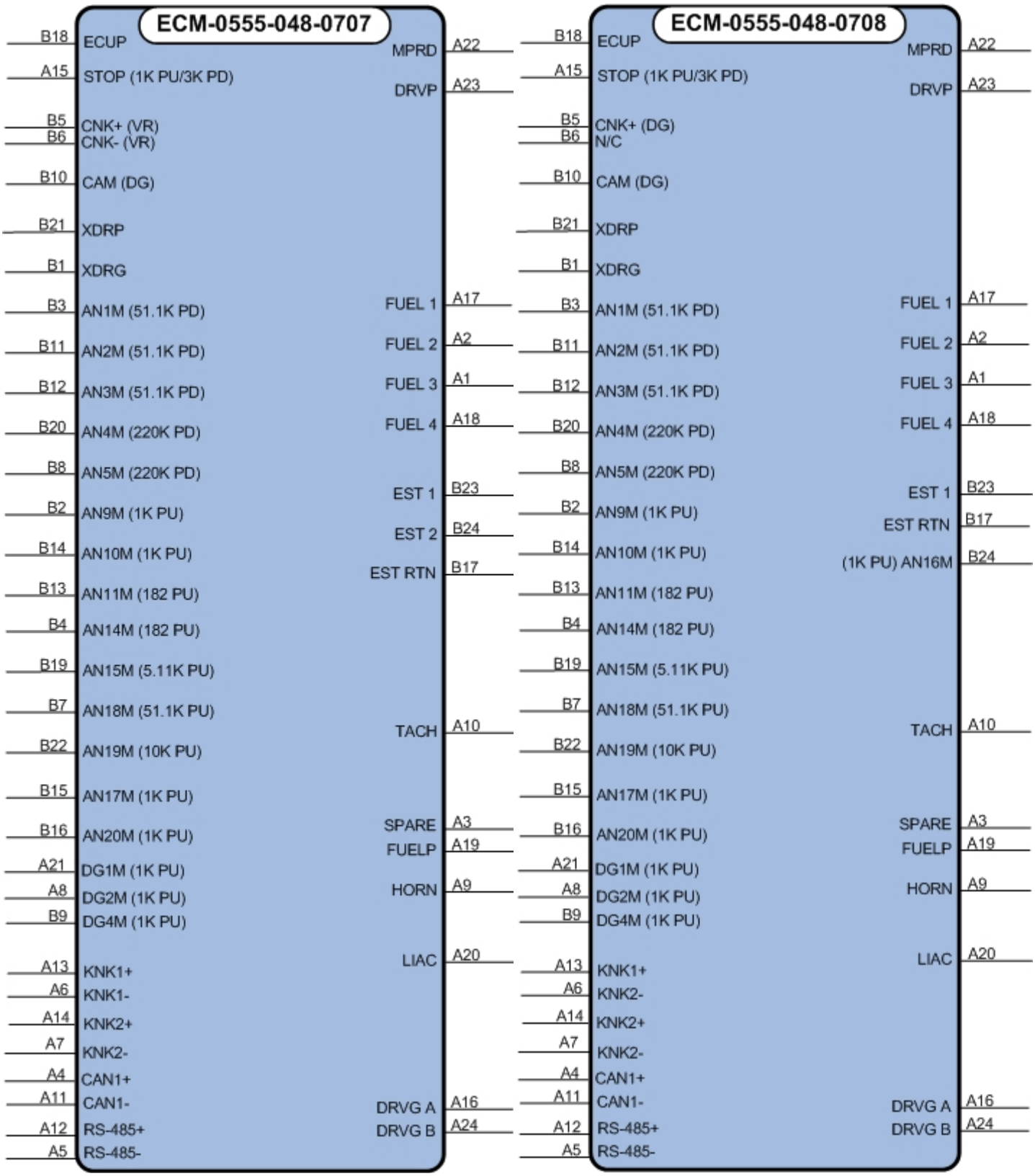
Connector A
MotoTron P/N: CON-FEML-001A
TYCO P/N: 4-1437287-5

Woodward P/N: 1635-1726

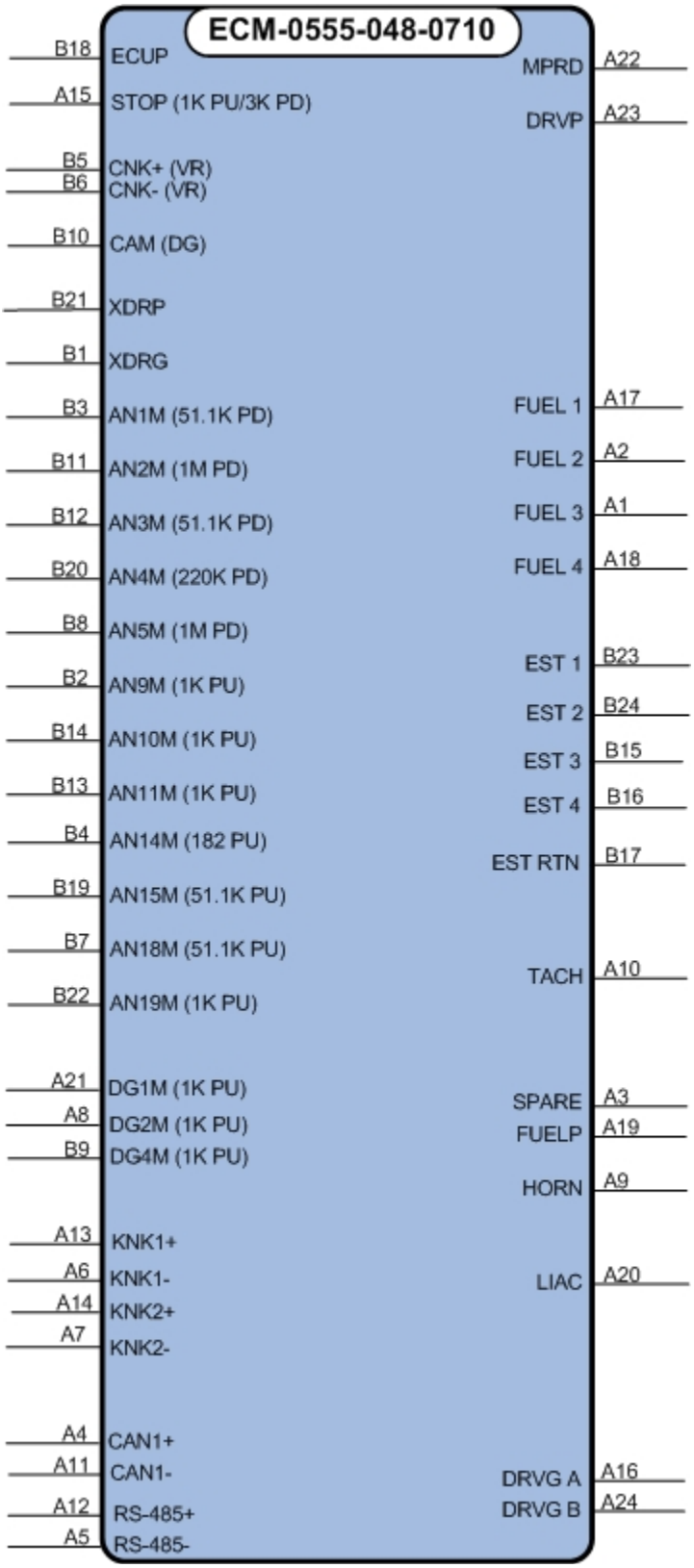
Block Diagrams



Block Diagrams *(continued)*



Block Diagrams *(continued)*



Signal Conditioning

Input Signal Conditioning	**Notes** (see Resource by Connector Pin table and/or block diagram for pull up/pull down resistor levels)
IMPORTANT **The ECM has been validated in an application using typical loads. Maximum loading is based on datasheet values. Actual capability is somewhere between typical (validated) and maximum (datasheet) and is dependent on ambient temperature, system voltage, and the state of all other inputs and outputs. In most cases it will not be possible for an application to use the maximum values. Please contact Woodward sales for more information.**	
Power and Ground **ECUP (B18), DRVP (A23), DRVG A (A16), DRVG B (A24)**	(Note: See Figure 1 in "Typical Circuit Schematics" section for Power and Ground Block Diagram)
ECUP (B18)	V_{BATT} (max) = 24 V (jump start) V_{BATT} (nom) = 8–16 V $V_{ADC} = 0.181\ V_{ECUP}$ (10-bit resolution) τ =1.8 ms
DRVP (A23)	V_{BATT} (max) = 24 V (jump start) V_{BATT} (nom) = 8–16 V $V_{ADC} = 0.181\ V_{DRVP}$ (10-bit resolution) τ =1.8 ms
DRVG A (A16), DRVG B (A24) These pins are the single point ground for the module.	**Note:** All DRVG terminals are internally connected (one electrical node).
STOP (A15) Upon assertion of the stop switch (or loss of ECUP) the unit disables the following outputs via hardware: - FUELP - EST1, EST2, EST3, EST4 (as applicable per model) - LSO1 (as applicable per model)	V_{IL} (max) = 1.8 V V_{IH} (min) = 1.9 V τ = 150 µs
CNK+ (B5), CNK- (B6) ECM0708: The CNK+ connector pin is used for sensing engine crankshaft position via a digital (such as Hall Effect) position sensor.	V_{IL} (max) = 2.0 V V_{IH} (min) = 3.0 V τ = 15 µs **Note:** ECM0701, 0704, 0707, 0710: Variable reluctance inputs. ECM0708: Digital (Hall)
CAM (DG) (B10) This input is intended to be used for sensing engine camshaft position via a digital (such as Hall Effect) position sensor.	V_{IL} (max) = 2.0 V V_{IH} (min) = 3.0 V **ECM0701, ECM0704, ECM0707, ECM0708:** τ = 150 µs **ECM0710:** τ = 15 µs
Analog Inputs **See Figure 2 in "Typical Circuit Schematics" section.**	V_{IN} = 0–5 V $V_{ADC} = V_{IN}$ τ = 1 ms Resolution= 10-bits
Digital Inputs **See Figure 3 in "Typical Circuit Schematics" section.**	V_{IN} = 0–5 V $V_{ADC} = V_{IN}$ V_{IL} (max) = 1.9 V V_{IH} (min) = 2.6 V V_{HYST} (min) = 0.5 V τ = 5 µs Resolution= 10-bits

Output Signal Conditioning	
See Figure 4 in "Typical Circuit Schematics" section.	Outputs are protected from shorts to battery and ground. Outputs have open circuit and short circuit detection.
XDRP (B21) 5-volt supply for analog sensors.	V_{OUT} = 4.9 to 5.1 V I_{OUT} (max) = 300 mA $V_{ADC} = 0.5V_{XDRP}$ T = 11 µs
MPRD (A22) This output energizes the Main Power Relay.	I_{SINK} (max) = 1 A V_{CLAMP}(min) = 50 V Note: Short-circuit protection, reverse battery protected, open-circuit, and short-circuit detection.
FUELP (A19)	I_{SINK} (max)= 10 A V_{CLAMP} (min) = 50 V **Note:** Recirculation diode. Disabled via hardware when STOP is asserted.
FUEL 1 (A17), FUEL 2 (A2), FUEL 3 (A1), FUEL 4 (A18) These outputs control the low-side of high impedance fuel injectors.	I_{SINK} (max)= 6 A V_{CLAMP} (min) = 50 V **Note:** Reverse battery protected. Short-circuit protection, open-circuit and short-circuit detection.
EST 1 (B23), EST 2 (B24), EST 3 (B15), EST 4 (B16) 5 V digital ignition outputs used to drive logic-level ignition coils. ECM0701 supports 4 EST outputs. ECM0704 supports 4 EST outputs. ECM0707 supports 2 EST outputs: EST 1, EST 2. ECM0708 supports 1 EST output: EST 1. ECM0710 supports 4 EST outputs.	V_{OL} (max) = 0.5 V at I_{SINK} = 1 mA V_{OH} (min) = 4.2 V at I_{SOURCE} = 0.5 mA **Note:** Short-circuit protection. Disabled via hardware when STOP is asserted.
EST RTN (B17)	Low current ground reference for logic-level ignition coils.
TACH (A10) Tachometer output with Link Interface capabilities.	I_{SINK} (max) = 1 A V_{CLAMP} (min) = 50 V **Note:** Short-circuit protection and short-circuit detection.
LSO1 (FUELP2) (A7) Low-side output. This output is only available on ECM0701. It uses the KNK1N connector pin and thus ECM0701 only supports a single knock sensor	I_{SINK} (max) = 10 A V_{CLAMP} (min) = 50 V **Note:** Disabled via hardware when STOP is asserted.
HORN (A9) Low-side output.	I_{SINK} (max) = 3 A V_{CLAMP} (min) = 50 V

Output Signal Conditioning	
LIAC (A20) Low-side output. This output is a high-current sink driver, 6 A max, with a recirculation diode.	I_{SINK} (max) = 3 A V_{CLAMP} (min) = 50 V **Note:** Recirculation diode. Short-circuit protection, open-circuit and short-circuit detection.
SPARE (A3) Low-side output.	I_{SINK} (max) = 3 A V_{CLAMP} (min) = 50 V **Note:** Recirculation diode. Short-circuit protection, open-circuit and short-circuit detection.

Communications	
CAN1+ (A4), CAN1- (A11)	High-speed CAN 2.0B bus
RS485+ (A12), RS485- (A5)	RS-485, programmable baud rate 1200 - 57600, 8 bits, No parity, 1 Stop Bit

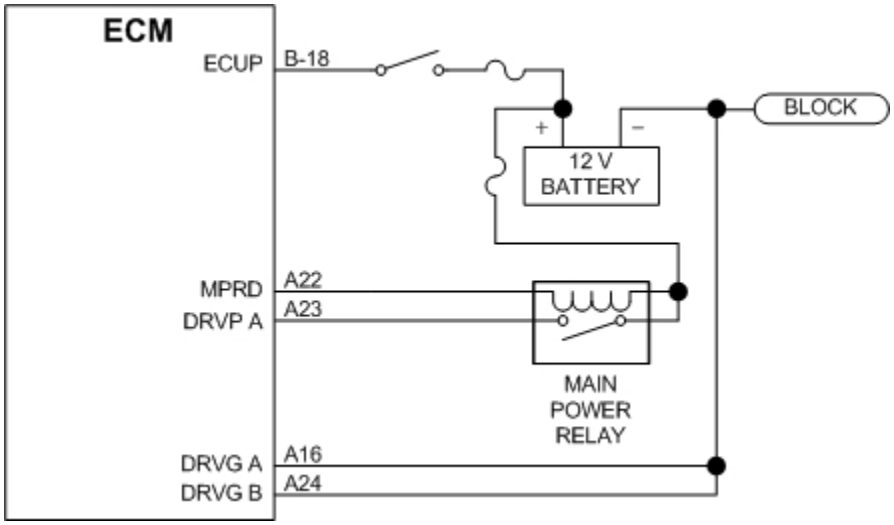
Memory	
FLASH	448K of FLASH memory, on chip
RAM	26K of RAM, on chip
EEPROM	ECM0701: 4K serial EEPROM ECM0704: 4K serial EEPROM ECM0707: 4K serial EEPROM ECM0708: 4K serial EEPROM ECM0710: 8K serial EEPROM

Signal Conditioning

Typical Circuit Schematics

Power and Ground

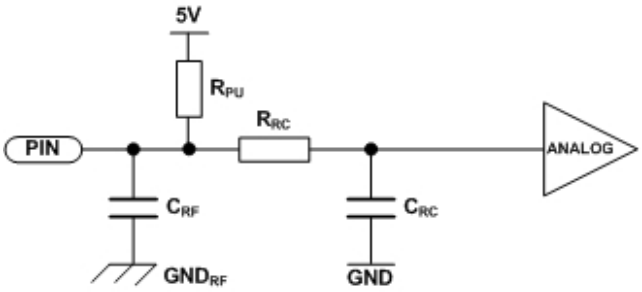
Figure 1:



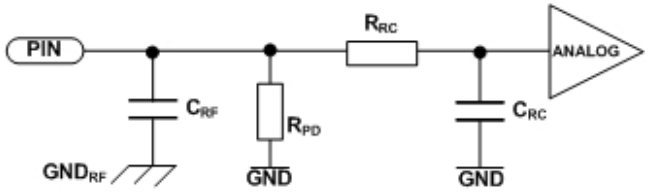
Analog Inputs

Figure 2:

Resistor Pull-up



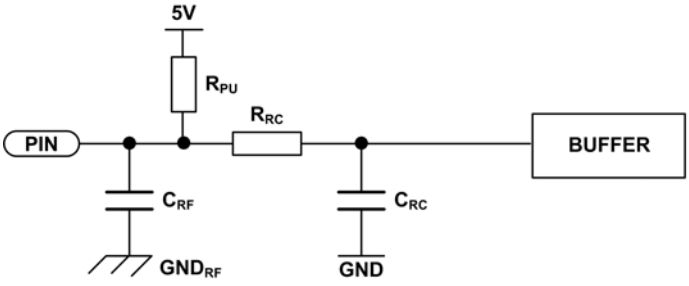
Resistor Pull-down



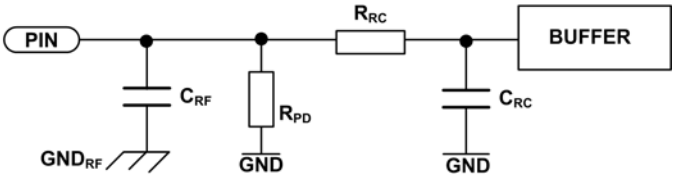
Digital Inputs

Figure 3:

Resistor Pull-up



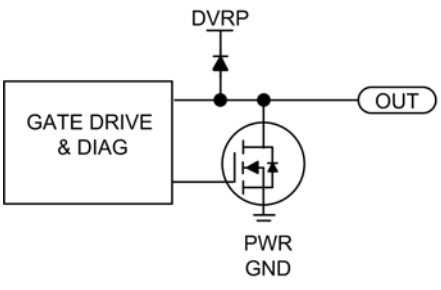
Resistor Pull-down



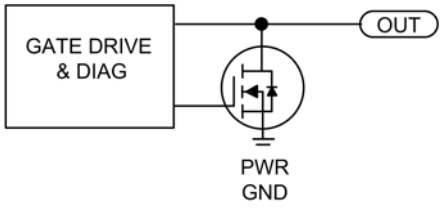
Typical Outputs

Figure 4:

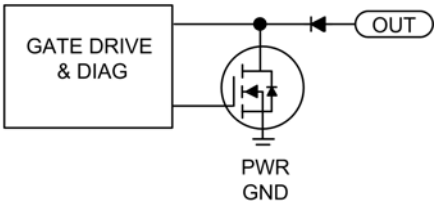
Recirculation Diode



Without Diode



Blocking Diode



Connector Pinouts

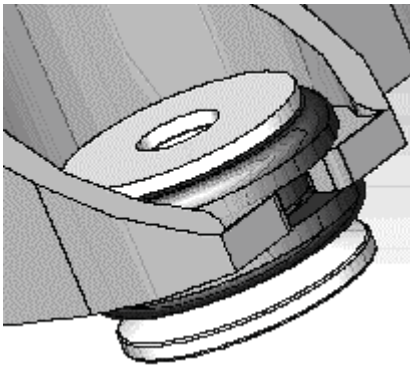
RESOURCE BY CONNECTOR PIN					
ECM Pin#	0701	0704	0707	0708	0710
A1	**FUEL 3**	**FUEL 3**	**FUEL 3**	**FUEL 3**	**FUEL 3**
	Fuel Injector Driver 3	Fuel Injector Driver 3	Fuel Injector Driver 3	Fuel Injector Driver 3	Fuel Injector Driver 3
	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver
A2	**FUEL 2**	**FUEL 2**	**FUEL 2**	**FUEL 2**	**FUEL 2**
	Fuel Injector Driver 2	Fuel Injector Driver 2	Fuel Injector Driver 2	Fuel Injector Driver 2	Fuel Injector Driver 2
	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver
A3	**SPARE**	**SPARE**	**SPARE**	**SPARE**	**SPARE**
	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver
A4	**CAN1+**	**CAN1+**	**CAN1+**	**CAN1+**	**CAN1+**
	CAN Hi signal	CAN Hi signal	CAN Hi signal	CAN Hi signal	CAN Hi signal
	CAN 2.0B	CAN 2.0B	CAN 2.0B	CAN 2.0B	CAN 2.0B
A5	**RS485-**	**RS485-**	**RS485-**	**RS485-**	**RS485-**
	Serial Communications	Serial Communications	Serial Communications	Serial Communications	Serial Communications
	RS-485	RS-485	RS-485	RS-485	RS-485
A6	**KNK1-**	**AN13M**	**KNK1-**	**KNK1-**	**KNK1-**
	Knock Sensor Lo	Analog Input 13	Knock Sensor Lo	Knock Sensor Lo	Knock Sensor Lo
	Differential broad-band	Rpullup= 1K	Differential broad-band	Differential broad-band	Differential broad-band
A7	**LSO1**	N/C	**KNK2-**	**KNK2-**	**KNK2-**
	Low Side Output 1	No Connection	Knock Sensor Lo	Knock Sensor Lo	Knock Sensor Lo
	Fuel pump2, recirc. diode		Differential broad-band	Differential broad-band	Differential broad-band
A8	**DG2M**	**DG2M**	**DG2M**	**DG2M**	**DG2M**
	Digital Input 2	Digital Input 2	Digital Input 2	Digital Input 2	Digital Input 2
	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K
A9	**HORN**	**HORN**	**HORN**	**HORN**	**HORN**
	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver
A10	**TACH**	**TACH**	**TACH**	**TACH**	**TACH**
	5 V Digital Output	5 V Digital Output	5 V Digital Output	5 V Digital Output	5 V Digital Output
	Rpullup= 1.8K to DRVP	Rpullup= 1.8K to DRVP	Rpullup= 1.8K to DRVP	Rpullup= 1.8K to DRVP	Rpullup= 1.8K to DRVP
A11	**CAN1-**	**CAN1-**	**CAN1-**	**CAN1-**	**CAN1-**
	CAN Lo signal	CAN Lo signal	CAN Lo signal	CAN Lo signal	CAN Lo signal
	CAN 2.0B	CAN 2.0B	CAN 2.0B	CAN 2.0B	CAN 2.0B
A12	**RS485+**	**RS485+**	**RS485+**	**RS485+**	**RS485+**
	Serial Communications	Serial Communications	Serial Communications	Serial Communications	Serial Communications
	RS-485	RS-485	RS-485	RS-485	RS-485

RESOURCE BY CONNECTOR PIN					
ECM Pin#	0701	0704	0707	0708	0710
A13	**KNK1+**	**KNK1+**	**KNK1+**	**KNK1+**	**KNK1+**
	Knock Sensor Hi	Knock Sensor Hi	Knock Sensor Hi	Knock Sensor Hi	Knock Sensor Hi
	Differential broad-band	Differential broad-band	Differential broad-band	Differential broad-band	Differential broad-band
A14	**DG3M**	**DG3M**	**KNK2+**	**KNK2+**	**KNK2+**
	Digital Input 3	Digital Input 3	Knock Sensor Hi	Knock Sensor Hi	Knock Sensor Hi
	Rpullup= 1.K	Rpullup= 1.K	Differential broad-band	Differential broad-band	Differential broad-band
A15	**STOP**	**STOP**	**STOP**	**STOP**	**STOP**
	Emergency Stop Input	Emergency Stop Input	Emergency Stop Input	Emergency Stop Input	Emergency Stop Input
	Disables Fuel and Spark	Disables Fuel and Spark	Disables Fuel and Spark	Disables Fuel and Spark	Disables Fuel and Spark
A16	**DRVG A**	**DRVG A**	**DRVG A**	**DRVG A**	**DRVG A**
	Driver Ground	Driver Ground	Driver Ground	Driver Ground	Driver Ground
A17	**FUEL 1**	**FUEL 1**	**FUEL 1**	**FUEL 1**	**FUEL 1**
	Fuel Injector Driver 1	Fuel Injector Driver 1	Fuel Injector Driver 1	Fuel Injector Driver 1	Fuel Injector Driver 1
	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver
A18	**FUEL 4**	**FUEL 4**	**FUEL 4**	**FUEL 4**	**FUEL 4**
	Fuel Injector Driver 4	Fuel Injector Driver 4	Fuel Injector Driver 4	Fuel Injector Driver 4	Fuel Injector Driver 4
	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver
A19	**FUELP**	**FUELP**	**FUELP**	**FUELP**	**FUELP**
	Fuel Pump	Fuel Pump	Fuel Pump	Fuel Pump	Fuel Pump
	Low Side Driver, recirculation diode	Low Side Driver, recirculation diode	Low Side Driver, recirculation diode	Low Side Driver, recirculation diode	Low Side Driver, recirculation diode
A20	**LIAC**	**LIAC**	**LIAC**	**LIAC**	**LIAC**
	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver	Low Side Driver
	Recirculation diode	Recirculation diode	Recirculation diode	Recirculation diode	Recirculation diode
A21	**DG1M**	**DG1M**	**DG1M**	**DG1M**	**DG1M**
	Digital Input 1	Digital Input 1	Digital Input 1	Digital Input 1	Digital Input 1
	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K
A22	**MPRD**	**MPRD**	**MPRD**	**MPRD**	**MPRD**
	Main Power Relay Driver	Main Power Relay Driver	Main Power Relay Driver	Main Power Relay Driver	Main Power Relay Driver
	Reverse battery diode, 1 A	Reverse battery diode, 1 A	Reverse battery diode, 1 A	Reverse battery diode, 1 A	Reverse battery diode, 1 A
A23	**DVRP**	**DVRP**	**DVRP**	**DVRP**	**DVRP**
	Driver Power	Driver Power	Driver Power	Driver Power	Driver Power
	Recirculation path	Recirculation path	Recirculation path	Recirculation path	Recirculation path
A24	**DRVG B**	**DRVG B**	**DRVG B**	**DRVG B**	**DRVG B**
	Driver Ground	Driver Ground	Driver Ground	Driver Ground	Driver Ground

RESOURCE BY CONNECTOR PIN					
ECM Pin#	0701	0704	0707	0708	0710
B1	**XDRG**	**XDRG**	**XDRG**	**XDRG**	**XDRG**
	Transducer Ground	Transducer Ground	Transducer Ground	Transducer Ground	Transducer Ground
	Analog ground reference	Analog ground reference	Analog ground reference	Analog ground reference	Analog ground reference
B2	**AN9M**	**AN9M**	**AN9M**	**AN9M**	**AN9M**
	Analog Input 9	Analog Input 9	Analog Input 9	Analog Input 9	Analog Input 9
	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K
B3	**AN1M**	**AN1M**	**AN1M**	**AN1M**	**AN1M**
	Analog Input 1	Analog Input 1	Analog Input 1	Analog Input 1	Analog Input 1
	Rpulldown= 51.1K	Rpulldown= 51.1K	Rpulldown= 51.1K	Rpulldown= 51.1K	Rpulldown= 51.1K
B4	**AN14M**	**AN14M**	**AN14M**	**AN14M**	**AN14M**
	Analog Input 14	Analog Input 14	Analog Input 14	Analog Input 14	Analog Input 14
	Rpullup= 182	Rpullup= 182	Rpullup= 182	Rpullup= 182	Rpullup= 182
B5	**CNK+**	**CNK+**	**CNK+**	**CNK+**	**CNK+**
	Crankshaft sensor Hi	Crankshaft sensor Hi	Crankshaft sensor Hi	Crankshaft sensor Hi	Crankshaft sensor Hi
	VR Only	VR Only	VR Only	Digital Only	VR Only
B6	**CNK-**	**CNK-**	**CNK-**	**N/C**	**CNK-**
	Crankshaft sensor Lo	Crankshaft sensor Lo	Crankshaft sensor Lo	No Connection	Crankshaft sensor Lo
	VR Only	VR Only	VR Only		VR Only
B7	**AN18M**	**AN18M**	**AN18M**	**AN18M**	**AN18M**
	Analog Input 18	Analog Input 18	Analog Input 18	Analog Input 18	Analog Input 18
	Rpullup= 51.1K	Rpullup= 51.1K	Rpullup= 51.1K	Rpullup= 51.1K	Rpullup= 51.1K
B8	**AN5M**	**AN5M**	**AN5M**	**AN5M**	**AN5M**
	Analog Input 5	Analog Input 5	Analog Input 5	Analog Input 5	Analog Input 5
	Rpulldown= 220K	Rpulldown= 220K	Rpulldown= 220K	Rpulldown= 220K	Rpulldown= 220K
B9	**DG4M**	**DG4M**	**DG4M**	**DG4M**	**DG4M**
	Digital Input 4	Digital Input 4	Digital Input 4	Digital Input 4	Digital Input 4
	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K
B10	**CAM**	**CAM**	**CAM**	**CAM**	**CAM**
	Camshaft Sensor	Camshaft Sensor	Camshaft Sensor	Camshaft Sensor	Camshaft Sensor
	Rpullup= 150K	Rpullup= 150K	Rpullup= 150K	Rpullup= 150K	Rpullup= 150K
B11	**AN2M**	**AN2M**	**AN2M**	**AN2M**	**AN2M**
	Analog Input 2	Analog Input 2	Analog Input 2	Analog Input 2	Analog Input 2
	Rpulldown= 51.1K	Rpulldown= 51.1K	Rpulldown= 51.1K	Rpulldown= 51.1K	Rpulldown= 51.1K
B12	**AN3M**	**AN3M**	**AN3M**	**AN3M**	**AN3M**
	Analog Input 3	Analog Input 3	Analog Input 3	Analog Input 3	Analog Input 3
	Rpulldown= 51.1K	Rpulldown= 51.1K	Rpulldown= 51.1K	Rpulldown= 51.1K	Rpulldown= 51.1K

RESOURCE BY CONNECTOR PIN					
ECM Pin#	0701	0704	0707	0708	0710
B13	**AN11M**	**AN11M**	**AN11M**	**AN11M**	**AN11M**
	Analog Input 11	Analog Input 11	Analog Input 11	Analog Input 11	Analog Input 11
	Rpullup= 51.1K	Rpullup= 51.1K	Rpullup= 51.1K	Rpullup= 51.1K	Rpullup= 51.1K
B14	**AN10M**	**AN10M**	**AN10M**	**AN10M**	**AN10M**
	Analog Input 10	Analog Input 10	Analog Input 10	Analog Input 10	Analog Input 10
	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K	Rpullup= 1K
B15	**EST 3**	**EST 3**	**AN17M**	**AN17M**	**EST 3**
	Electronic Spark Timing 3	Electronic Spark Timing 3	Analog Input 17	Analog Input 17	Electronic Spark Timing 3
	Drives logic level ignit. coil	Drives logic level ignit. coil	Rpullup= 1K	Rpullup= 1K	Drives logic level ignit. coil
B16	**EST 4**	**EST 4**	**AN20M**	**AN20M**	**EST 3**
	Electronic Spark Timing 4	Electronic Spark Timing 4	Analog Input 20	Analog Input 20	Electronic Spark Timing 3
	Drives logic level ignit. coil	Drives logic level ignit. coil	Rpullup= 1K	Rpullup= 1K	Drives logic level ignit. coil
B17	**EST RTN**	**EST RTN**	**EST RTN**	**EST RTN**	**EST RTN**
	EST Return	EST Return	EST Return	EST Return	EST Return
	Digital Ground Ref.	Digital Ground Ref.	Digital Ground Ref.	Digital Ground Ref.	Digital Ground Ref.
B18	**ECUP**	**ECUP**	**ECUP**	**ECUP**	**ECUP**
	ECU Power	ECU Power	ECU Power	ECU Power	ECU Power
B19	**AN15M**	**AN15M**	**AN15M**	**AN15M**	**AN15M**
	Analog Input 15	Analog Input 15	Analog Input 15	Analog Input 15	Analog Input 15
	Rpullup= 150K	Rpullup= 150K	Rpullup= 150K	Rpullup= 150K	Rpullup= 150K
B20	**AN4M**	**AN4M**	**AN4M**	**AN4M**	**AN4M**
	Analog Input 4	Analog Input 4	Analog Input 4	Analog Input 4	Analog Input 4
	Rpulldown = 220K	Rpulldown = 220K	Rpulldown = 220K	Rpulldown = 220K	Rpulldown = 220K
B21	**AN1M**	**AN1M**	**AN1M**	**AN1M**	**AN1M**
	Analog Input 1	Analog Input 1	Analog Input 1	Analog Input 1	Analog Input 1
	Rpulldown= 51.1K	Rpulldown= 51.1K	Rpulldown= 51.1K	Rpulldown= 51.1K	Rpulldown= 51.1K
B22	**XDRP**	**XDRP**	**XDRP**	**XDRP**	**XDRP**
	Transducer Power	Transducer Power	Transducer Power	Transducer Power	Transducer Power
	5 V Sensor Power	5 V Sensor Power	5 V Sensor Power	5 V Sensor Power	5 V Sensor Power
B23	**EST 1**	**EST 1**	**EST 1**	**EST 1**	**EST 1**
	Electronic Spark Timing 1	Electronic Spark Timing 1	Electronic Spark Timing 1	Electronic Spark Timing 1	Electronic Spark Timing 1
	Drives logic level ignit. coil	Drives logic level ignit. coil	Drives logic level ignit. coil	Drives logic level ignit. coil	Drives logic level ignit. coil
B24	**EST 2**	**EST 2**	**EST 2**	**EST 2**	**EST 2**
	Electronic Spark Timing 2	Electronic Spark Timing 2	Electronic Spark Timing 2	Electronic Spark Timing 2	Electronic Spark Timing 2
	Drives logic level ignit. coil	Drives logic level ignit. coil	Drives logic level ignit. coil	Drives logic level ignit. coil	Drives logic level ignit. coil

Environmental Ratings

Environmental Ratings	Notes
The ECM is designed for automotive, under hood and marine industry environmental requirements. Validation tests include extreme operating temperatures, thermal shock, humidity, salt spray, salt fog, immersion, fluid resistance, mechanical shock, vibration, and EMC. The customer must contact Woodward and provide the intended environmental conditions in the application for verification of performance capability.	
Storage Temperature	–40 to +105 °C
Operating Temperature	–40 to +85 °C
Thermal Shock	–40 to +125 °C, air-to-air, 500 cycles
Fluid Resistance	Two-stroke motor oil, four-stroke motor oil, unleaded gasoline, ASTM Reference 'C' fuel
Humidity Resistance	85% humidity at 85 °C for 1000 hours
Salt Fog Resistance	500 hours. 5% salt fog, 35 °C
Immersion	Preheat to 90 °C for 30 min. Immersed in water at 25 °C, 4.34 psi (30 kPa) for 20 min.
Mechanical Shock	50 g's, 11 ms, 4 shocks in each direction (24 total)
Drop Test	Drop test on concrete from 1 meter
Vibration This ECM family has been successfully deployed in engine mounted applications ranging from common small displacement engines to large racing engines with extreme vibrations. Electrical and mechanical isolation is achieved via Woodward mounting hardware (consisting of grommet, bushing, and washer) shown to the right. ***IMPORTANT*** **For prior verification of performance capability, contact Woodward and provide the vibration profile of the intended application.**	

Programming Information

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 (or cable, depending on the model) 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.

Refer to “Ordering Information” on p. 2 for related boot key/cable part numbers.

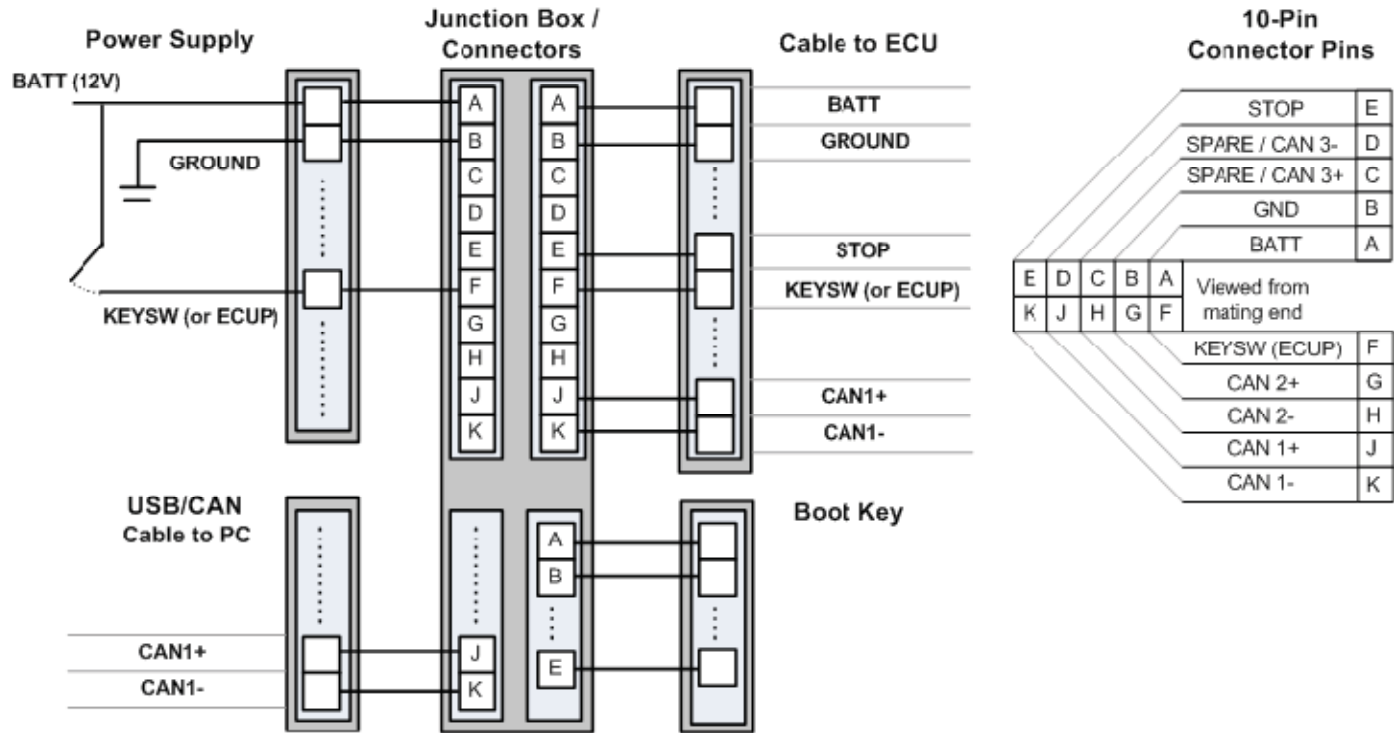
WARNING **Remove the ECU from direct control connections before performing the reboot procedure, as outputs are set to defaults or undefined states, with unpredictable and possibly hazardous results if applied.**

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.

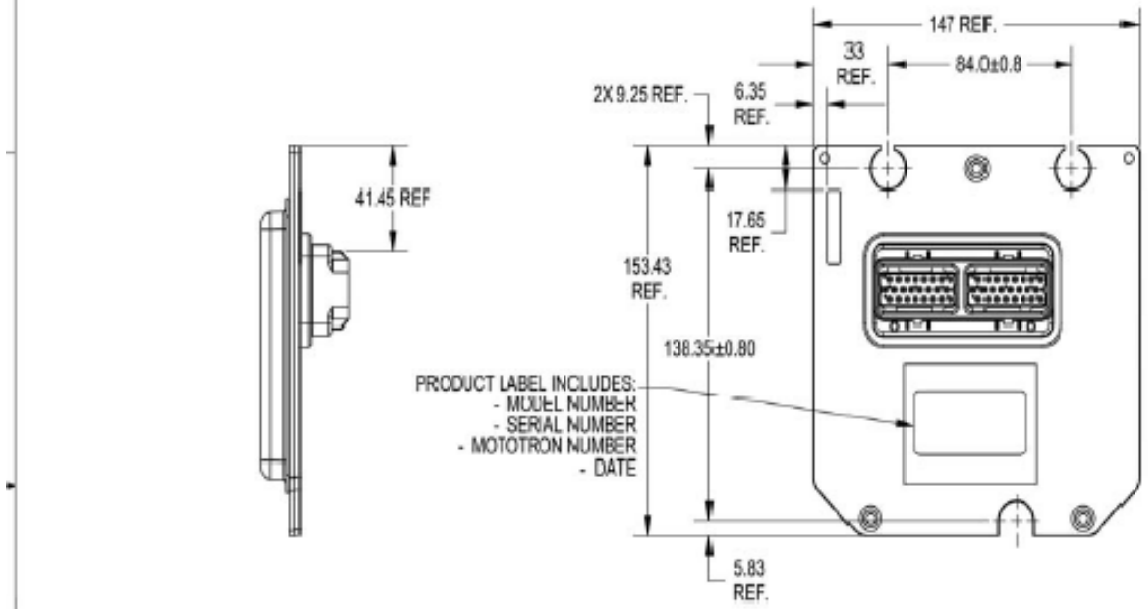
The module must “wake-up” – KEYSW (or ECUP) on – with the boot key or cable connections applied as described in order to initiate a reboot and to absorb the selected program.

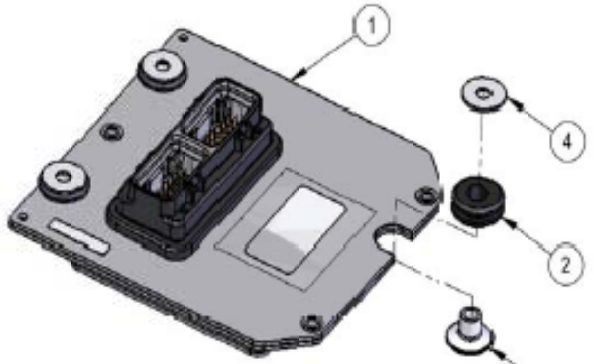
Note: A boot key provides a 555 Hz, 50% duty cycle, $V=V_{batt}$, square wave signal to the STOP pin, which may be duplicated by applying this signal from a signal generator to that pin.



ITEM NO.	MOTOTRON PART NUMBER	DESCRIPTION	QTY.	NOTE
1	ECM48	ECM48 - GENERAL	1	
2	GRMT-RBBR-001	GROMMET, RUBBER - CONTROLLER	3	"-M" NUMBER ONLY
3	BUSH-ALUM-001	BUSHING, ALUMINUM - CONTROLLER	3	"-M" NUMBER ONLY
4	WASH-FLAT-002	WASHER, FLAT	3	"-M" NUMBER ONLY

REVISIONS					
ZONE	DATE	REV.	DESCRIPTION	DRAWN BY	APPROVED





SHOWN WITH MOUNTING HARDWARE

NOTES:

1. MATING CONNECTOR CONSISTS OF THE FOLLOWING MOTOTRON COMPONENTS:

   ASSEMBLY = ASM-CON-002:

   - CON-FEML-001A
   - CON-FEML-001B
   - CON-COVR-001A
   - CON-TMFL-002
   - CON-PLUG-002

2. APPROX. WEIGHT: 360g - CONTROLLER ONLY (384g WITH MOUNTING HARDWARE)

0 KPC'S PER MOTOTRON STANDARD DOC-STND-001-00 AS NOTED BY ◪ OR ■

UNLESS OTHERWISE SPECIFIED
METRIC TOLERANCE
LINEAR: X ±.5, .XX ±.2, .XXX ±.13
ANGULAR ±1°
BREAK ALL SHARP EDGES
ASD Y14.5-1994
MATERIAL ---
FINISH ---

	DATE	NAME
DRAWN	01-07-08	KRL
CHECKED	01-09-08	JCF
ENG APPR.	01-09-08	TAB

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MOTOTRON. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MOTOTRON IS PROHIBITED.

MotoTron
Production Controls in a Flash
605 MARION ROAD
OSHKOSH, WISCONSIN 54901

TITLE:
ECM48 0555 PLATFORM
ASSEMBLY

SIZE	DWG. NO.	REV
B	ECM-0555-048-XXXX-XXX-X	00

SCALE: 1:2 | WEIGHT: | SHEET 1 OF 1

PO Box 1519, Fort Collins CO, USA 80522-1519
1000 East Drake Road, Fort Collins CO 80525
Tel.: +1 (970) 482-5811 ◆ Fax: +1 (970) 498-3058
mcsinfo@woodward.com ◆ mcs.woodward.com
www.woodward.com

Distributors & Service

Woodward has an international network of distributors and service facilities. For your nearest representative, call the Fort Collins plant or see the Worldwide Directory on our website.

For more information contact:

2011/10/Colorado