WOODWARD

MotoTron Control Solutions
Product Guide

Fast • Flexible • Affordable • Production Controls in a Flash

Fast and Flexible
Electronic Control Systems

Bring exciting new products and sophisticated product features to market quickly.

Woodward's MotoTron Control Solutions product line offers fast development cycle times, high flexibility and customer ownership of control strategy intellectual properties. Based on a suite of controller products, software tools, and application engineering expertise, you can build your production controls in a flash.

- Auto-Code Enabled Operating System
- Model-Based Control Technology
- Rugged Product Controllers
- On-Board Diagnostics
- CAN Multiplexing

Woodward engineers have many years of experience supplying to and developing complex applications serving a wide range of industries, including:

Gasoline Engine and Transmission Control

Diesel Engine / Emissions Control

Hybrid Vehicle Systems

Chassis – Hydraulics Control

Autonomous Vehicles

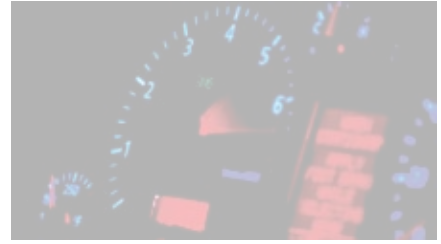On and Off-Highway

Recreational

Industrial

Marine

Aviation

Power Generation

Small Engine Management

Electric Motor and Power Inverters

Integration – Multiplexing / CAN Based Control

Woodward offers an array of rugged electronic control modules (ECMs) for automotive, marine and heavy-duty vehicle applications. Woodward's control modules have been specified for engine, hydraulic, powertrain, hybrid vehicle and general purpose control. Our engineers are continually adding new levels of functionality to our ECMs.

Many companies find that specifying an existing MotoTron Control Solutions ECM for their application is a way to eliminate costly tooling bills and is often faster and provides a fast path to production compared to developing a new ECM. For customers with existing hardware solutions, Woodward also supports custom hardware with our tools and software.

Intended for extreme environmental conditions, our ECMs are durable and completely sealed, making them suitable for automotive, commercial truck, marine and industrial applications. T

Our modules meet full production, environmental, and packaging requirements. Over 1 million Woodward MotoTron Control Solutions ECMs are currently in the field.

Woodward's ECMs are economical both in small quantities for rapid prototyping and fleet testing, and large quantities for production. They range from 24 pins to 128 pins and come with 16-bit and 32-bit microprocessors.

In addition to engine control modules, Woodward offers a full range of sensors, actuators and custom wiring harnesses for complete control systems. These components can be combined to create complete control systems such as engine management systems and are shipped directly to your manufacturing floor.
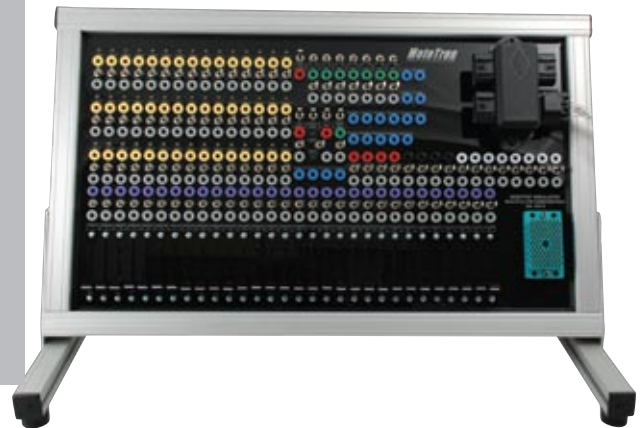
MotoHawk

ControlCore **SERVER**

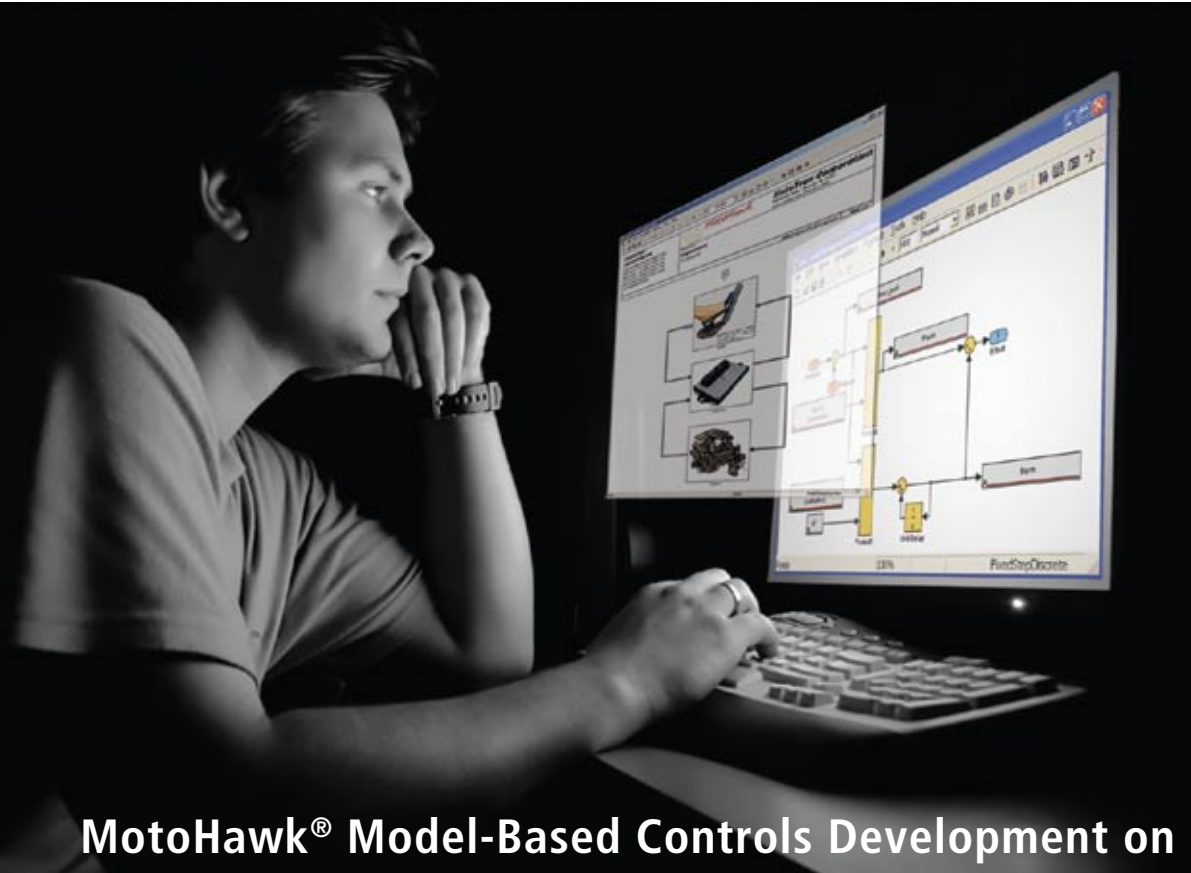*Fuse*

Production

MotoHawk® Model-Based Controls Development on   Real ^Hardware

Your Rapid Control Development System...

MotoHawk, an add-on to MatLab/Simulink, allows you to create control system software in the familiar graphical language of Simulink. It allows you to run control system software not only on your PC, but on rugged embedded control hardware suitable for harsh production environments.

Why use MotoHawk?

MotoHawk enables application designers to create algorithm solutions directly from Simulink without the need to write source code. MotoHawk supports a model-based design philosophy and enhances this process with the ability to directly target the solution to production hardware.

Model-based designs employ heavy use of simulation and analysis within the design environment of MatLab and Simulink. MotoHawk extends this environment directly into the run time of the embedded controller. MotoHawk is bundled with MotoTune®, our calibration tool. MotoHawk applications can also communicate via CCP, Keyword 2000, UDP, and other industry standard protocols.

Is MotoHawk only useful for Control Algorithms? What about the rest of the embedded system?

MotoHawk allows you to design not only the control algorithms but also the difficult and abstract features of modern control systems. CAN interfaces, Faults and Diagnostics, Complex I/O, such as Fuel Injection sequences and Engine Synchronization, and Operating System configuration like task priorities and coherent data transfer are all easy to implement with MotoHawk.

Does MotoHawk run on any hardware?

MotoHawk runs only on Woodward's ControlCore™ enabled hardware — a full line-up of modules from small 24 pin, 16-bit based micro controllers to 128 pin, 32-bit based microprocessors capable of running 12 cylinder engines.

Our modules feature pin count and I/O options suitable for a wide variety of applications including Engine Management Systems, Diesel Emissions, Hydraulic Control, Electric Motor Control, Navigation Systems, and Distributed I/O systems.

Creating applications for all of these different modules and markets is done in one familiar design environment of MotoHawk. Switching an application from one module to another is simple. We can also port MotoHawk to your hardware.

Is MotoHawk suitable for Prototype and Production Development?

Yes. The MotoHawk workflow was designed to enable design, analysis, and development of robust control systems for production deployment, as well rapid prototyping. By using similar hardware and processes, prototyping with a large I/O module early in the discovery phase allows the algorithms and models to start maturing very early in the life cycle.

MotoHawk models flow into production development and validation without the need for translation (from another prototyping solution). Because the algorithms have run on production intent hardware, their resource impact is well known, thus avoiding the super computer solutions that will not scale to production.

Constrained Rapid Prototyping allows reuse of code throughout the life cycle — providing a faster overall path to production.

WOODWARD

Features

- Auto-code generation of Simulink/Stateflow models using Embedded Coder/Stateflow Coder
- Rugged controllers for prototyping and production
- ControlCore enabled software
- Off-the-shelf engine control libraries
- Calibration using MotoTune or CCP based tools
- Responsive engineering and support services for a wide-range of applications
- Electronic control modules available for development, fleet and production

Benefits

- Simpler, faster development
- Better testing using real ECM hardware
- Quickly develop and enhance software features in Simulink
- Analyze and control real-time OS from Simulink/Stateflow
- Direct access to the production controller's I/O from Simulink
- Readable documentation of system design automatically created from models
- Lower cost for fleet testing; outfit an entire test fleet with rapid prototyping capability
- Custom block-set allows for integration of both handwritten and auto-code

System Requirements Hardware:

- 256 MB RAM
- USB 1.1 or higher
- 1024x768 monitor†
- Serial port

Microsoft Software:

- Windows Vista, XP, or 2000

The MathWorks Software:

- Versions: R12.1, R13, or R14, 2007a & b
- MATLAB Simulink
- Real-Time Workshop
- Embedded Coder
- Stateflow*
- Stateflow Coder*

Compilers

- Green Hills Multi C for the MPC5XX and MPC5554
- Freescale Metrowerks for the HCS12/S12X
- *Optional, but recommended
- †Higher resolution recommended

What do I get if I purchase MotoHawk?

MotoHawk is bundled into a developer's kit, which includes a module, harness, CAN to USB interface, MotoTune Software, MotoHawk software, and compilers for the target module. Our modules and accessories are available in small quantities with attractive pricing.

A MotoHawk purchase also includes three days of in-depth training. Led by our team of experienced developers, the hands-on training enables the new practitioner to fully experience the tool chain by building, deploying, calibrating, and refining a real world control application.

128 Pin MotoHawk Developer's Kit

SOFTWARE

CONTROLLERS

CONNECTORS & KITS

DEV TOOLS

HARNESSES

SYSTEM COMPONENTS

Product Summary — 128-pin MotoHawk Kit

- ECM Module
- Harness with SmartCraft Connector, Relay, and Fuse
- MotoHawk Blockset for Simulink
- Greenhills C Compiler (required)
- MotoTune® Hardware, and Software
- Keyswitch
- SmartCraft to J1939 adapter
- SmartCraft to DB9 (GMLAN) adapter
- 8 port Smartcraft Hub
- 4 Port Isolated USB Hub
- Security Dongle
- BootKey

ORDERING INFORMATION

MotoHawk Development Kits include everything you need to begin developing your control system application. Purchase options include the standard 128-pin MotoHawk kit (shown), a customizable MotoHawk Development Suite (you choose the module), or a bare bones MotoHawk license (without hardware or software). Kit options are available with or without the required Green Hills C Compiler.

Woodward Item No.	Reference Number	Description
8928-1267	ASMHAWK005D00	128-pin MotoHawk kit

Everything you need to get started with MotoHawk using our 128-pin module.
(C compiler sold separately.)

(1) ASSEMBLY CD - MOTOHAWK DEVELOPMENT
(1) DUAL CHANNEL USB TO CAN CABLE
(1) MOTOHAWK & MOTOTUNE LICENSED DONGLE
(1) USB OPTICALLY ISOLATED 4-PORT HUB W/POWER SUPPLY
(2) JUNCTION BOX - (6) WAY
(1) CONNECTOR TEMINATOR - 120 OHM (CD,JK) - BLUE CAP
(1) KEY POWER TO BUS
(1) KEY SWITCH WITH BEZEL
(2) HARNESS EXTENSION- 6' CAN1 & CAN2 DATA CABLE
(1) HARNESS EXTENSION- 10' CAN1 & CAN2 DATA CABLE W/RESISTOR
(1) DB9 TO CAN1 & CAN2 (CD,JK)
(1) KEY SWITCH TO JUNCTION BOX - 3'
(1) SmartCraft to J1939 (CD, JK)
(1) ECM0565128L702C00-M (CALIBRATIBLE) W/MOUNTING HARDWARE
(1) ECM565-128 PIN DEVELOPMENT HARNESS
(1) BOOT KEY
(1) HARNESS USB INTERFACE

Order one of the following Green Hills C Compiler licenses.

Woodward Item No.	Reference Number	Description
8928-1275	ASM-GHS-001A	Node Locked Green Hills Software License
8928-1273	ASM-GHS-001B	Domestic (US) Dongle Locked Green Hills Software License
8928-1272	ASM-GHS-001C	International (non-US) Dongle Locked Green Hills Software License

Woodward Item No.	Reference Number	Description
8928-1172	ASMHAWK006D01	MotoHawk Development Suite

The MotoHawk Development Suite includes everything you need to get started with MotoHawk using any one of our electronic control modules — allowing you to customize your rapid prototyping system.

(1) ASSEMBLY CD - MOTOHAWK DEVELOPMENT
(1) DUAL CHANNEL USB TO CAN CABLE
(1) MOTOHAWK & MOTOTUNE LICENSED DONGLE
(1) USB OPTICALLY ISOLATED 4-PORT HUB W/POWER SUPPLY
(2) JUNCTION BOX - (6) WAY
(1) CONNECTOR TEMINATOR - 120 OHM (CD,JK) - BLUE CAP
(1) KEY POWER TO BUS
(1) KEY SWITCH WITH BEZEL
(2) HARNESS EXTENSION- 6' CAN1 & CAN2 DATA CABLE
(1) HARNESS EXTENSION- 10' CAN1 & CAN2 DATA CABLE W/RESISTOR
(1) DB9 TO CAN1 & CAN2 (CD,JK)
(1) KEY SWITCH TO JUNCTION BOX - 3'
(1) SmartCraft to J1939 (CD, JK)
(1) HARNESS USB INTERFACE

Order one of the following Green Hills C Compiler licenses.

Woodward Item No.	Reference Number	Description
8928-1275	ASM-GHS-001A	Node Locked Green Hills Software License
8928-1273	ASM-GHS-001B	Domestic (US) Dongle Locked Green Hills Software License
8928-1272	ASM-GHS-001C	International (non-US) Dongle Locked Green Hills Software License

Select an Electronic Control Module to suit your needs. (See the Controllers section for more information.)

Order the associated development harness. (See the Harness section for more information.)

Add the boot key below for any of the following electronic control modules:

ECM-0555-048, GCM-0563-048, HCM-0563-048, ECM-0555-080, ECM-0565-128, ECM-555X-112

Woodward Item No.	Reference Number	Description
1635-1800	HARNINTR00801	Boot Key

Woodward Item No.	Reference Number	Description
8928-1191	ASMHAWK999C	MotoHawk license

The bare bones MotoHawk license includes a software CD and licensed dongle – no other software or hardware.

Speed Your Time to Market...

Spark Ignition Base Engine Control (Gas)

- Closed Loop Fuel Control
- Diagnostic Engine Protection
- EGO Based Adaptive Fuel
- Electronic or Mechanical Throttle Control
- Energy Based Coil Characterization with Voltage Compensation
- Fault Buffer and Freeze Frame
- Fault Code MIL Operation
- Idle Air and Spark Control
- MAF Based Adaptive Volumetric Efficiency
- Make-Up Pulse Transient Fueling
- Mass Based Fuel Injector Characterization with Voltage and Pressure Compensation
- Min, Max, and All-Speed Governor Control
- Modelled Airflow and Fuel Flow
- Power Enrichment
- Redundancy Arbitration For ETC System
- Rev Limiting
- Sensor & Actuator Open and Short Circuit Fault Detection
- Sequential or Batch Fueling
- Sequential, Wasted, or Distributed Spark
- Tau-X Transient Fueling
- Temperature and Pressure Spark and Fuel Compensators
- TPS Based Transient Fueling

Compression Ignition Base Engine Control (Diesel)

- Airflow Model
- Boost Control
- Diagnostic Engine Protection
- Electronic Throttle Control
- Equivalence Ratio (Smoke) Limiting
- Fault Buffer and Freeze Frame
- Fault Code MIL Operation
- Fuel Flow Model
- Fuel Pump Control
- Glow Plug Control
- Min, Max, and All-Speed Governor Control
- Multiple Pulse Injection Strategy
- Redundancy Arbitration For ETC System
- Rev Limiting
- Sensor & Actuator Open and Short Circuit Fault Detection
- Torque and Friction Model
- Warm-Up Compensation
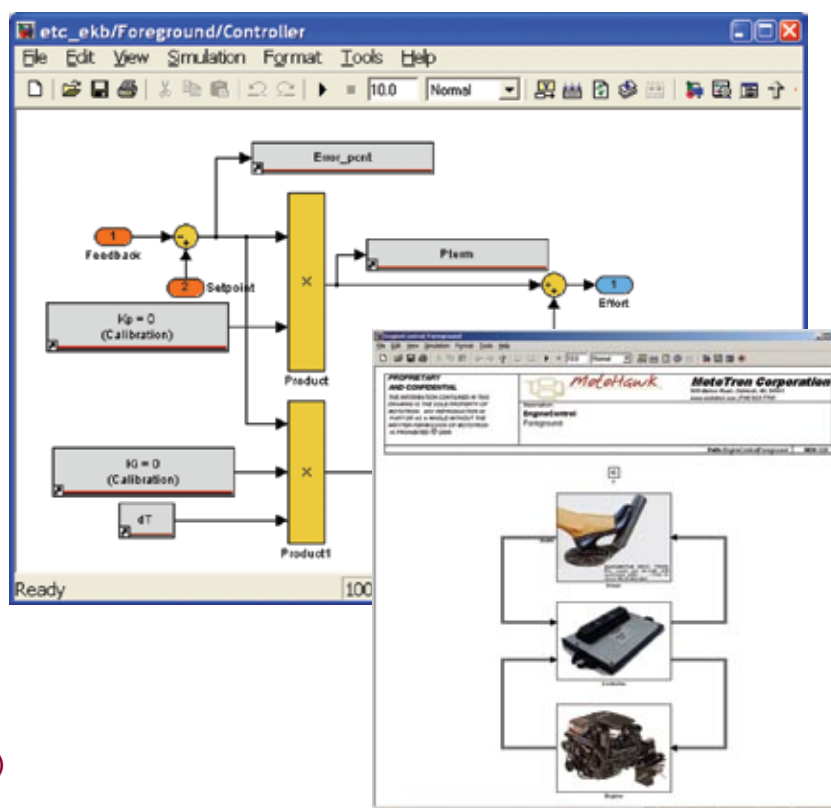
ORDERING INFORMATION

Base Engine Control MotoHawk Models are available for gas and diesel engine control. The software family also includes a variety of add-ons to speed your development time. Woodward's knowledgeable sales team can help you determine which models best suit your application needs.

Woodward Item No.	Reference Number	Description
5418-3254	IA-MHBECSI001	MOTOHAWK MODEL — SPARK IGNITION BASE ENGINE CONTROL
5418-3253	IA-MHBECCI001	MOTOHAWK MODEL — COMPRESSION IGNITION BASE ENGINE CONTROL
5418-3252	IA-MH4L80001	GM 4L80E TRANSMISSION CONTROLLER
5418-3256	IA-MHFREZFRAME001	REAL TIME FAULT TRIGGERED DATA CAPTURE
5418-3258	IA-MHKNOCK001	FILTER
5418-3259	IA-MHLOGGER001	EEPROM BASED DATA LOGGER
5418-3260	IA-MHMAPSYNC001	MAP BASED CAMLESS SYNC
5418-3261	IA-MHMISSFIRE001	MISSFIRE DETECTION MONITOR
5418-3262	IA-MHPOSTO2001	POST O2 SENSOR
5418-3264	IA-MHSTEPPER001	STEPPER MOTOR CONTROLLER TORQUE BASED CONTROL FOR SPARK
5418-3265	IA-MHTORQCTRL001	MOTOHAWK MODEL TORQUE CONTROL
5418-3266	IA-MHUEGO001	WIDE BAND 02 SENSOR CONTROLLER KNOCK CONTROLLER WITH BAND PA
5418-3267	IA-MHVCT001	VARIABLE CAM TIMING INTERPRETATION

SOFTWARE

CONTROLLERS

CONNECTORS & KITS

DEV TOOLS

HARNESSES

SYSTEM COMPONENTS
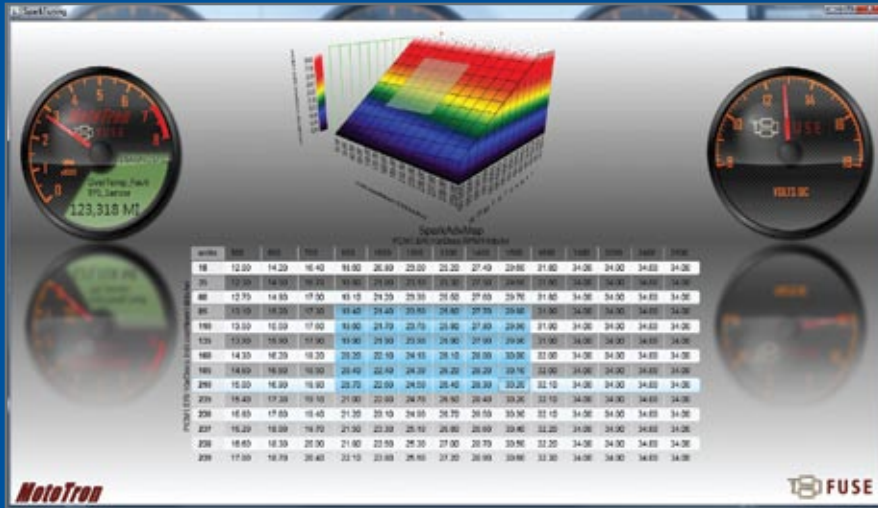
Product Summary

Fuse is a Visualization application builder with connections to system data. Through a drag & drop design surface, Fuse allows non-programmers & design professionals to create rich visualizations connected to the runtime data of real embedded systems.

Fuse builds on Microsoft's Presentation Foundation (WPF) to bring state-of-the-art visualization of your system's data to your desktop and mobile tools.

Using Expression Blend, a tool created by Microsoft for user interface design professionals, Fuse-enabled user interfaces come together seamlessly.
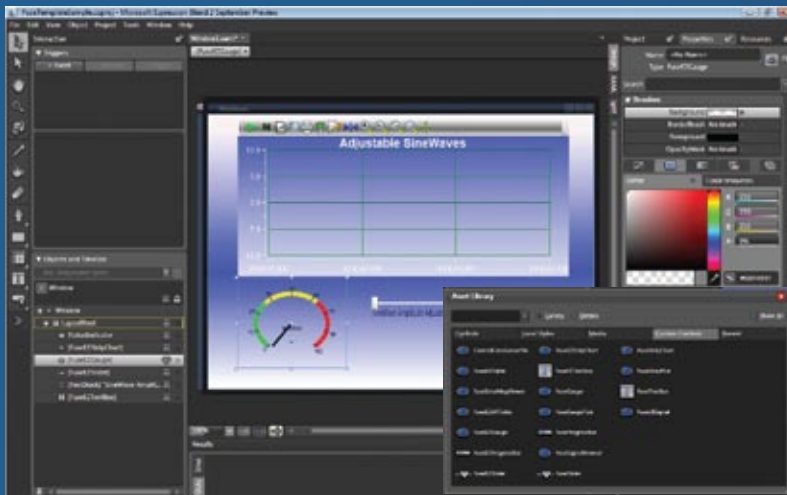
New toolsets for your MotoHawk project

By integrating ControlCoreServer connectivity into Blend, Fuse gives non-Windows programmers and design professionals the ability to do new things.

Fuse plugs into Expression Blend adding a number of new controls to your toolbox.

Blend allows the creation of custom controls for tools available at design time.

Fuse provides a palette of pre-built controls, including gauges, sensors, and 3D mapping; allowing rapid visualization development within your project.

Customer-centric palettes can also be designed to give your project a unique feel.

WOODWARD

SOFTWARE

CONTROLLERS

CONNECTORS & KITS

DEV TOOLS

HARNESSES

SYSTEM COMPONENTS

Product Summary

ControlCore Server (CCS) is a framework for enabling communication and run-time visibility into & around embedded systems. It is also the host for PC applications that require communication, simulation, calibration, run-time analysis, CAN data logging and validation with respect to embedded modules and their relevant software. CCS provides unique offerings such as Networking CAN Buses using a TCP/IP pipe between geographically separated locations.

ControlCore Server's primary goals are gathering information about the supplied system, housing the system information in the form of signals, and making the information available from a variety of access points.

Features

The CCS framework supports application-building technologies through the various signal interfaces it exposes and provides interface support via:

- HTTP Interface
- TCP / XML Stream Interface
- Command-Line / Telnet Interface
- MATLAB Interface

ControlCore Server is the host process on the PC for other applications that do the following:

- Simulate Hardware/Software Entities
- Calibration
- Analysis
- Testing & Validation
- Visualization

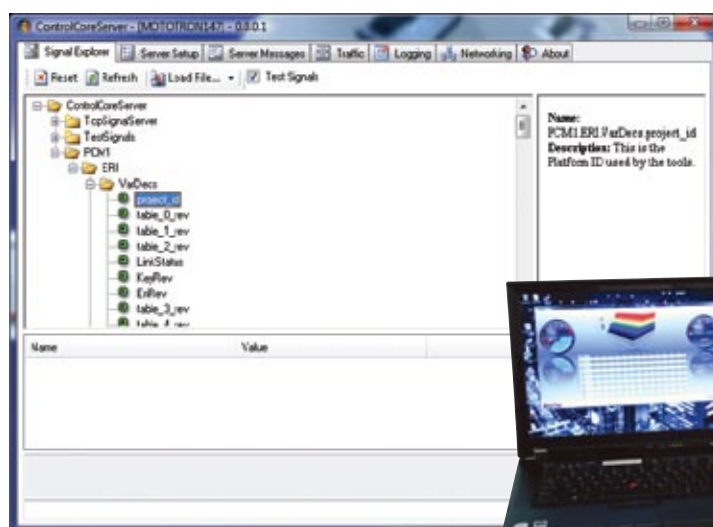Inter-server networking (virtual CAN network)

Traffic explorer

Information; errors & warnings

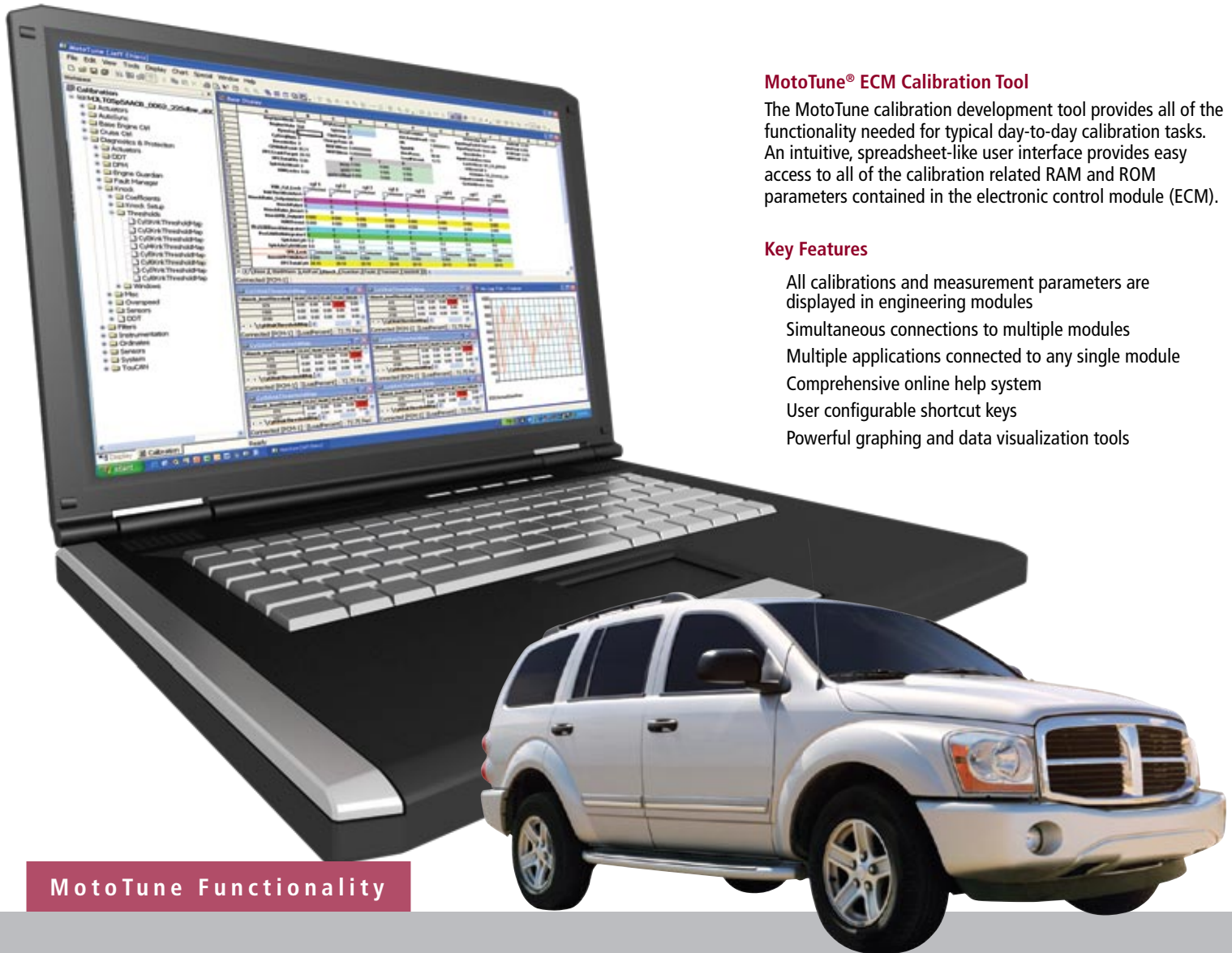CAN hardware & server setup

System signals

Signal list view

Signal commands

SOFTWARE
MotoTune

MotoTune® ECM Calibration Tool

The MotoTune calibration development tool provides all of the functionality needed for typical day-to-day calibration tasks. An intuitive, spreadsheet-like user interface provides easy access to all of the calibration related RAM and ROM parameters contained in the electronic control module (ECM).

Key Features

- All calibrations and measurement parameters are displayed in engineering modules
- Simultaneous connections to multiple modules
- Multiple applications connected to any single module
- Comprehensive online help system
- User configurable shortcut keys
- Powerful graphing and data visualization tools

MotoTune Functionality

Calibration (ROM) Editing

- Multi-document, spreadsheet-like calibration map interface
- 1-D and 2-D linear interpolation autofill capability
- Map operating point auto-follow mode
- Multi-type calibration map graphical display capability
- On-line and off-line editing with automatic synchronization
- Cut and paste to other PC applications
- Intelligent calibration map print utility
- High/low resolution parameter incrementing via PC keyboard
- Calibration scroll-back buffer
- Calibration creation via upload from module
- Intuitive parameter directory tree structure with "find" function

ECM Flash Programming

- Built in ECM programming capability
- Programming directly from merge utility

Calibration/Software File Management

- File version management with unlimited, internally stored user comments
- Partial-calibration management (calibration parameters subsets)
- Automated file transfer/upgrade to new software formats and map breakpoint array scalings (includes automated rescaling and interpolation)
- Calibration file compare utility
- Calibration/software merge utility

Parameter (RAM) Display, Override, and Logging

- Multi-document, user-configurable display parameter interface (spreadsheet-like display configuration - fonts, colors, borders, etc.)
- Many graphing styles and data visualization tools
- Configurable parameter lock and offset capability
- Configurable parameter warning limits
- Integral spreadsheet-like math formula capability
- Built-in parameter strip charting and logging capability
- Full interactive diagnostic tool interface

SOFTWARE

CONTROLLERS

CONNECTORS & KITS

DEV TOOLS

HARNESSES

SYSTEM COMPONENTS

ORDERING INFORMATION

Each MotoTune kit part number differs based upon the number of USB to CAN channels your application requires. We offer up to 2 CAN channels and supply you with the needed MotoTune hardware, allowing you to quickly begin your calibrations.

Each kit contains one silver USB dongle specifically designed for developers. Need additional non-developer dongles? Contact us — specific keys are available.

Each MotoTune purchase includes one year of software upgrades and support.

Woodward Item No.	Reference Number	Description
8928-1208	ASMTUNE40000	STANDARD MOTOTUNE KIT (USB TO CAN CABLES NOT INCLUDED)
8923-1498	ASMTUNE41000	STANDARD MOTOTUNE KIT WITH 1 CHANNEL USB TO CAN CABLE
5404-1259	ASMINTR01300	1 CHANNEL USB TO CAN KVASER CABLE
1626-1116	CONJBOX00201	JUNCTION BOX - (6) WAY
1649-1078	CONTERM00200	CONNECTOR TERMINATOR - 120 OHM (CD,JK) - BLUE CAP
5404-1152	HARNEXTN002A00	HARNESS EXTENSION- 6' CAN1 & CAN2 DATA CABLE
5404-1157	HARNEXTN003A00	HARNESS EXTENSION- 10' CAN1 & CAN2 DATA CABLE W/RESISTOR
8923-1512	ASMTUNE42000	STANDARD MOTOTUNE KIT WITH 2 CHANNEL USB TO CAN CABLE
5404-1252	ASMINTR00600	2 CHANNEL USB TO CAN KVASER CABLE
1626-1116	CONJBOX00201	JUNCTION BOX - (6) WAY
1649-1078	CONTERM00200	CONNECTOR TERMINATOR - 120 OHM (CD,JK) - BLUE CAP
5404-1152	HARNEXTN002A00	HARNESS EXTENSION- 6' CAN1 & CAN2 DATA CABLE
5404-1157	HARNEXTN003A00	HARNESS EXTENSION- 10' CAN1 & CAN2 DATA CABLE W/RESISTOR

ECM Production Programming Tool

The MotoFlash™ production programming system provides a complete solution for low to high volume Electronic Control Module programming requirements.

Key Features

- Simple scan of 2 barcodes to initiate the start of programming sequence
- Product label printed automatically after the completion of download
- Comprehensive online help system
- User configurable toolbar
- Extensive use of Microsoft GUI standards to promote user familiarity

Your Production Programming & Labeling System

Woodward Item No.	Reference Number	Description
	ASMFLSH-XXX	MOTOFLASH KIT
1796-1083	ASMCD00900	MOTOFLASH CD
8928-5121	ASMCRPT02900	DONGLE - MOTOFLASH
5404-1249	ASMDC00100	DC ADAPTER TO SC (POWER SUPPLY)
5404-1259	ASMINTR01300	1 2 CHANNEL USB2CAN INTERFACE CABLE
1009-1501	COMPHDWR00100	WEDGE SCANNER
8923-1528	COMPHDWR00300	COMPUTER SYSTEM
1751-8016	COMPPRNT00100	ZEBRA PRINTER
2018-1011	COMPPRNT00200	ZEBRA PRINTER RIBBON
1626-1116	CONJBOX00201	JUNCTION BOX 6 WAY
1649-1078	CONTERM00200	TERMINATOR
3061-1770	GENLABL00300	1 PACKAGE MYLAR OVERLAY
3061-1771	GENLABL00400	1 PACKAGE CONTROLLER LABEL
5404-1152	HARNEXTN002A00	6' CAN EXTENSION HARNESS
5404-1164	HARNEXTN00501	HARNESS SC to JUNCTION BOX 6"
5404-1186	HARNINTR00900	ZEBRA PRINTER CABLE
5404-1241	HARNSECM01200	MOTOFLASH SECM PROGRAMMING HARNESS

Each MotoFlash purchase includes 1 day of on-site set-up, one day of on-site training, one year of software upgrades and support.

USB to CAN

MotoViewer — ECM Data Display Tool

Product Summary

The MotoViewer™ system provides an economical solution for basic electronic control module data and diagnostic needs.

Key Features

- Comprehensive online help system
- Graphical data logging
- Detailed fault diagnostic list
- Activate and test a variety of loads (ignition, injectors etc.)
- View controller fault history
- Clear active and historic faults
- View engine runtime hours
- View engine sensor data
- Chart option to graph data
- User familiarity through use of Microsoft GUI standards

MotoUpdate — ECM Field Re-Programming Tool

Product Summary

The MotoUpdate™ tool provides an easy solution for reprogramming ECMs in the field or service shop.

Key Features

- Allow field/service personnel to update an module when new calibrations are required
- Simple one step process
- Save time and money by updating the module on site
- Don't wait for the overnight delivery truck to bring your customer an updated ECM calibration

Functionality

- Simple and easy to use application
- Operator friendly – requires basic computer skills to initiate the programming download to ECU
- Programming file can be configured to only allow reprogramming based on previous software ID eligibility
- Includes a detailed user information update readme file authored by authorized engineering staff

ORDERING INFORMATION

MotoService kits ship with or without a USB2CAN cable as indicated below. Order the appropriate kit to fit your needs.

MOTOSERVICE KITS

Woodward Item No.	Reference Number	Description
8928-1203	ASMMSVC003A	KIT - STANDARD - NO USB2CAN
8923-1464	ASMMSVC003A-1	KIT - STANDARD - 1CH USB2CAN

USB to CAN

SOFTWARE

CONTROLLERS

CONNECTORS & KITS

DEV TOOLS

HARNESSES

SYSTEM COMPONENTS

RUGGED DESIGN

Introducing the Power Inverter Module

The PIM-5554-060-0801 power inverter module is a high-power density DC to AC inverter module capable of operating in harsh automotive, marine, and off-highway applications. Induction motors and permanent magnet brushless motors are supported. The inverter executes an open architecture space vector algorithm including closed loop current feedback, field weakening, bus ripple management, and regeneration.

In addition to the shielded bus and phase outputs the inverter has a 60-pin environmentally sealed application connection system. This enables interface to analog and digital I/O and allows control of various outputs including pumps, fans and clutches. Acceptable cooling media include 50/50 ethylene glycol/water, hydraulic fluids and compressed air.

The PIM-5554-060-0801 utilizes a Freescale 5554 processor leveraging the ControlCore family of embedded controls solutions. Woodward's ControlCore™ operating system, MotoHawk® code generation product, and MotoHawk suite of development tools enable rapid development of complex control systems, making this the world's first model based programmable inverter.

Hardware Features:
Microprocessor: Freescale MPC5554, 128 MHz
Memory: 2MB Internal Flash, 64k Internal Ram, .5 mb External RAM
Operating Voltage: 9-32 VDC, High voltage to 400 VDC
Operating Temperature: -40 to 85 °C

Inputs:
6 analog inputs (1k pull-up)
4 analog inputs (220k pull-down)
4 analog inputs (51k pull-down)
Primary/Secondary Resolver (Sin/Cosine/Ref)
4 Hall speed inputs
Encoder (A,B,Z)

Outputs:
4 analog outputs
3 low side drivers
Coolant Pump 7A
2 H-Bridge 8A Circuits
Isolated 50MOhm Three-Phase Motor output
Up to 15kHz switching frequency

Datalinks:
2 CAN 2.0b buses

WOODWARD

Electronic Control Modules

Woodward provides rugged electronic control modules that are especially designed and built for use in harsh automotive, heavy duty and industrial environments. With a wide range of processing power and input/output capabilities, the product line encompasses modules designed for almost every application – from the very simple to the very complex – and also provides straightforward migration paths to meet changing application requirements.

Woodward control modules are available in configurations optimized for various applications, including engine and powertrain control (ECM); general-purpose control (GCM), and hydraulic control (HCM). Designs and capabilities are updated regularly, so consult with your Woodward representative to select the control that is best suited for your application requirements.

24-Pin Form Factor

For simple applications, our 24-pin modules are available in an engine and powertrain control (ECM) configuration, using a Freescale HCS12 processor running at 24 Mhz, and in general-purpose (GCM) configuration based on Freescale HCS12 (24 MHz) or MPC565 (56 MHz) processors. Typical applications include single cylinder and single point injected 4 cylinder engines, CAN gateways, and diesel after-treatment control systems.

48-Pin Form Factor

Delivering more I/O and processing power, our 48-pin modules are available in engine / powertrain (ECM), general purpose (GCM), and hydraulic (HCM) control configurations. Depending on configuration, the 48-pin modules are based on Freescale MPC555 (40 MHz) or MPC563 (56 MHz) processors. Typical applications include engine-emissions control, transmissions, and hydraulics for small industrial 4 cylinder sequential and 8 cylinder batch-fire engines.

70-Pin Form Factor

Our new 70-pin modules are designed for engine and powertrain (ECM) control. Based on a Freescale HCS12XE processor running at 50 MHz, these modules incorporate a solid complement of memory storage; multiple frequency, crank position and EGO oxygen sensor inputs; as well as CAN2.0B and RS-485 communications. These modules are targeted for low cost, fixed-point, 4 cylinder engine applications.

Call your Woodward representative for availability.
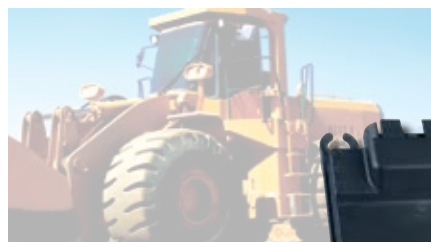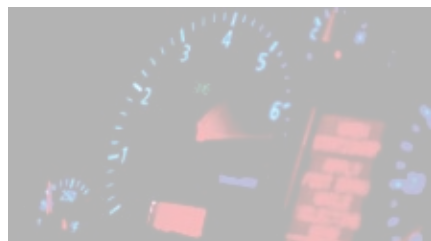
80-Pin Form Factor

Our 80-pin modules are designed for engine and powertrain (ECM) control. Based on a Freescale MPC555 processor running at 40 Mhz, the 80-pin module includes multiple DSP knock inputs, optional EGO oxygen sensor inputs, as well as a high-current H-Bridge driver. Typical applications include knock control and peak/hold fuel injection for 12 cylinder sequential engines.

112-Pin Form Factor

For demanding engine and powertrain (ECM) control applications, our 112-pin modules are based on Freescale MPC5553 or 5554 processors running at 80 MHz. The 112-pin modules offer a full complement of memory storage, as well as multiple frequency, crank position, and DSP knock detection inputs. The module also includes four differential EGO oxygen sensor inputs. Typical applications include full OBD2 8 cylinder sequential engines.

128-Pin Form Factor

Designed for large scale engine and powertrain (ECM) control, our 128 pin module delivers optimal flexibility for complex control strategies. Built on the proven MPC565 processor, the onboard floating point unit and high clock frequency allow software to be developed in shorter times. Dual CAN 2.0B datalinks ensure interoperability with other vehicle systems. Typical applications include general rapid prototyping, peak/hold fuel injection, and 12 cylinder sequential engines.

ECM-5554-112
Engine Control Module

PHYSICAL DIMENSIONS (Drawings and models available upon request.)

48 mm

96 mm

176.5 mm

203.7 mm

226.6 mm

39.1 mm

Product Summary

The ECM-5554-112 is a high-end control module family capable of operating in harsh automotive, marine, and off-highway applications. The family and its connector system are environmentally sealed and suitable for engine mounting in many applications.

This unit provides 112 connector pins with inputs, outputs, and communications interfaces that support a wide variety of applications.

The ECM-5554-112 is part of the ControlCore™ family of embedded controls systems. Woodward's 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.

IMPORTANT! Woodward does not warranty this ECM 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 Woodward sales for more information.

Hardware Features
Microprocessor: Motorola MPC5554, 80 MHz
Memory: 2MB Flash, 64K RAM, + 32K Cache, 32K EEPROM
Calibratible Memory: 512k (256k x2) RAM
Operating Voltage: 9-16VDC, 24V (Jump start), 4.5V (Crank)
Operating Temperature: -40° to 105° C

Inputs
VR and Digital Engine Position Sensor (crank and cam) Inputs
33 Analog Inputs
4 Oxygen Sensor Inputs
3 Speed (digital) Inputs
2 Knock Sensor Inputs
1 Emergency Stop Input

Outputs
8 Injector (high impedance) Outputs
8 Electronic Spark Trigger (5V) Outputs
1 Tachometer or Link Interface Output
14 Low Side Outputs
1 Main Power Relay Driver Output
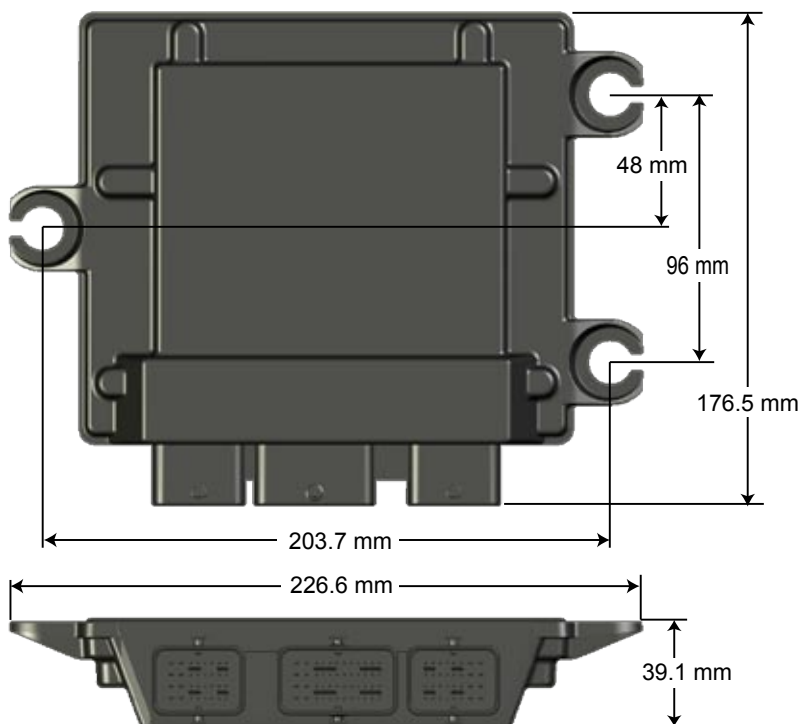2 H-Bridge Outputs
Datalinks
3 CAN buses
1 RS485 Channel

Notes
GHS 4.2.1 version required

ORDERING INFORMATION

PLATFORM ECM5554-112 — ACTIVE CONTROLLERS

Flash Controllers		Calibratible Controllers	
Woodward Item No.	Reference Number	Woodward Item No.	Reference Number
1751-6302	ECM55541120902F00	1751-6435	ECM55541120902CP0

ECM5554-112 RELATED HARDWARE

Woodward Item No.	Reference Number	Description
8923-1413	ASMCON042	Connector Kit
8996-2158/8996-2159	TOOLCON016/017	Crimp Tools
8996-2160/8996-2161	TOOLCON018/019	Removal Tools
1635-1800	HARNINTR00801	Boot Key
	N/A (not required)	Boot Cable
5404-1215	HARNP112001	Pigtail
5404-1216	HARNP112002	Development Harness
5404-1217	HARNP112003	Programming Harness
8923-1404	ASMBBOX1121002	Breakout box
5404-1205	HARNINTR026A	Desktop Simulator Front End Harness

SIMPLE BLOCK DIAGRAM

Number of Inputs

0902

Engine Position	2
KNK Knock	2
WBO₂ Wide Band	
O₂ Oxygen	4
Digital	3
Analog	33
STOP Stop	1

ECM-5554-112

Number of Outputs

0902

Main Power Relay	1
H Bridge	2
Injector	8
Spark Trigger	8
Tachometer	1
Digital	
Low Side	14
High Side	

0902

0902

CAN 1   RS-485

SOFTWARE

CONTROLLERS

CONNECTORS & KITS

DEV TOOLS

HARNESSES

SYSTEM COMPONENTS
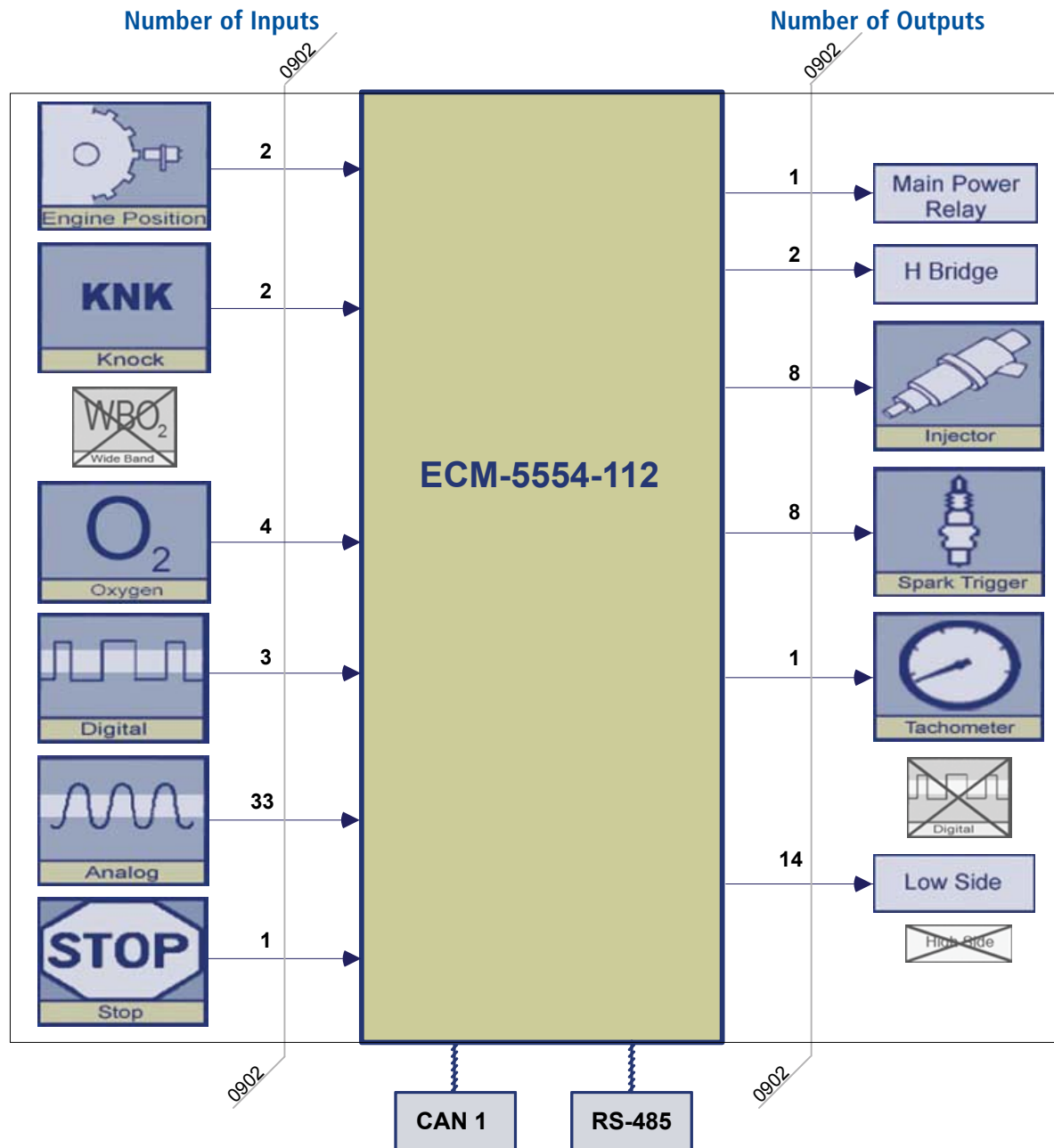
Product Summary

The ECM-0565-128 module is a rugged embedded control system capable of operating in harsh automotive, marine, and off-highway applications. This ECM is part of the Woodward's family of electronic control modules with **over 1 million units successfully deployed in the field.** Numerous successful marine applications prove the capability of this module. Based on a proven microprocessor, the ECM-0565-128 is capable of delivering complex control strategies. The onboard floating point unit and high clock frequency allow software to be developed in shorter times. Dual CAN 2.0B datalinks ensure interoperability with other vehicle systems.

The ECM-0565-128, part of the ControlCore™ product line, uses Woodward's production-proven ControlCore operating system. Control software for specific applications is developed with autocode generation, calibration and visualization tools from Woodward's MotoHawk development suite.

IMPORTANT! Woodward does not warranty this ECM 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 Woodward sales for more information.

Hardware Features

Microprocessor: MPC565, 56MHz
Memory: 1M Flash, 548K RAM, 8K Serial EEPROM,
         64Kx8 Parallel EEPROM
Operating Voltage: 9-32VDC
Operating Temperature: -40° to 105° C
Sealed connectors operable to 10ft submerged

Inputs

30 Analog Inputs
4 Low Frequency Discrete Inputs
4 VR Frequency Inputs
2 Wide Range O_2 Sensor Inputs
Dual Lambda Sensor Interface
2 Dual Sensor Wide Band Knock Detectors

Outputs

6 3A /1A Peak/Hold Injector Drivers
6 7A/3A or 3A/1A Peak/Hold Inj. Drivers
16 TTL Level Ignition System Outputs
10 3A Low Side PWMs
1 1.5A Tachometer Output
2 5A H-Bridge PWMs
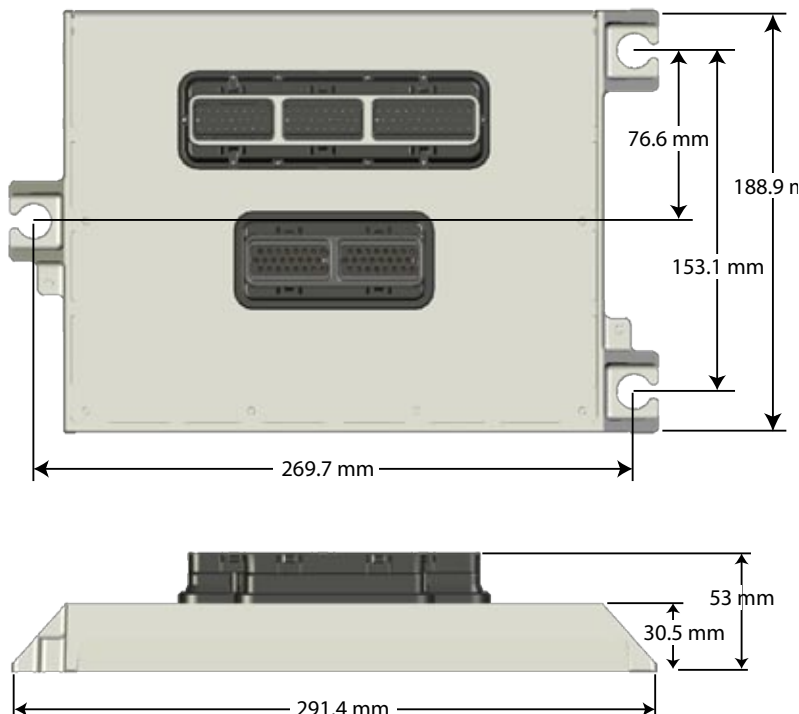1 10A H-Bridge PWM
1 Relay Driver (Main Power)

Datalinks

2 CAN 2.0B Channels
1 ISO 9141 Channel
(KWP2000/HWP2000, 10.4kbps)
1 RS485 Channel

Notes

GHS 3.6 version required

PHYSICAL DIMENSIONS (Drawings and models available upon request.)

76.6 mm
188.9 mm
153.1 mm
269.7 mm
53 mm
30.5 mm
291.4 mm

ORDERING INFORMATION

PLATFORM ECM565-128 — ACTIVE CONTROLLERS

Flash Controllers		Calibratible Controllers	
Woodward Item No.	Reference Number	Woodward Item No.	Reference Number
8237-1237	ECM0565128H701F00	1751-6421	ECM0565128L702CP0

ECM565-128 RELATED HARDWARE

Woodward Item No.	Reference Number	Description
8923-1408	ASMCON00300	Connector Kit
8996-2150	TOOLCON00800	Crimp Tools
	1/16" punch	Removal Tools
1635-1800	HARNINTR00801	Boot Key
	N/A (not required)	Boot Cable
5404-1218	HARNP12800100	Pigtail
5404-1219	HARNP12800200	Development Harness
	N/A (not required)	Programming Harness
8923-1405	ASMBBOX1281002	Breakout box
5404-1206	HARNINTR027A	Desktop Simulator Front End Harness

SOFTWARE

CONTROLLERS

CONNECTORS & KITS

DEV TOOLS

HARNESSES

SYSTEM COMPONENTS

Product Summary

The ECM-0555-080 engine control module is a rugged embedded control system capable 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-0555-080 is 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-0555-080 is part of the ControlCore family of embedded controls systems. Software for this module can be created utilizing model-based automatic code generation via Woodward's MotoHawk development suite.

IMPORTANT! Woodward does not warranty this ECM 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 Woodward sales for more information.

Hardware Features

Microprocessor: MPC555, 40MHz
Memory: 448K Flash, 26K RAM, 8K EEPROM
128Kx8 Parallel EEPROM (ECM-0555-080-0703-C)
Operating Voltage: 9-16VDC
Operating Temperature: -40° to 105° C
Sealed connectors operable to 10 ft. submerged.

Inputs

15 Analog Inputs
3 Low Frequency Digital Inputs
1 VR Frequency Input
Up to 2 Hall Effect Frequency Inputs
Dual Sensor Wide Band Knock Detection Input
Dual O_2 (Lambda) Sensor
1 Emergency Stop Input

Outputs

12 3A Peak/1A Hold Injector Drivers
8 TTL Level Ignition System Outputs
6 6A Low Side PWM
1 5A Discrete H-Bridge
1 5A PWM H-Bridge
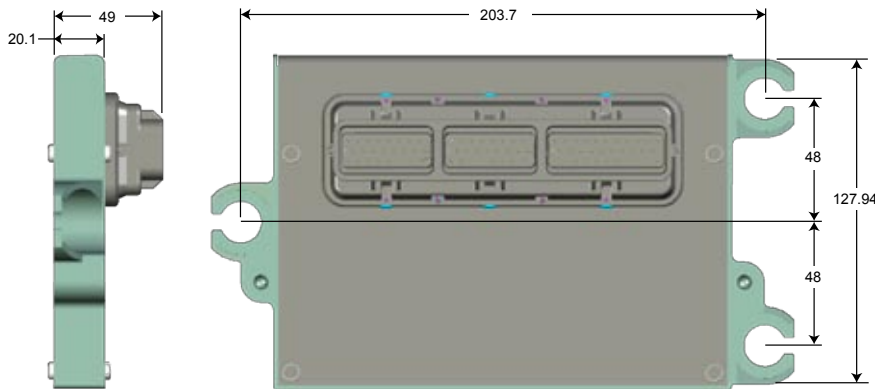1 Relay Driver (Main Power)
2 1.5 A Low Side PWM

Datalinks

2 CAN 2.0B Channels
1 RS485 Channel

Notes

GHS 3.6 required

PHYSICAL DIMENSIONS (Drawings and models available upon request.)

WOODWARD

ORDERING INFORMATION

PLATFORM ECM555-80 — ACTIVE CONTROLLERS

Flash Controllers			Calibratible Controllers		
Item No.	w/Mounting Hardware	Controller ID	Item No.	w/Mounting Hardware	Controller ID
1751-6401	8923-1559	ECM05550800801F00			
1751-6403	8923-1561	ECM05550800802F00	1751-6402	8923-1560	ECM05550800802CP0
1751-6405	8923-1563	ECM05550800803F00	1751-6404	8923-1562	ECM05550800803CP0

ECM555-80 RELATED HARDWARE

Item No.	Reference Number	Description
8923-1406	ASMCON00100	Connector Kit
8996-2150	TOOLCON00800	Crimp Tools
	1/16" punch	Removal Tools
1635-1800	HARNINTR00801	Boot Key
	N/A (not required)	Boot Cable
5404-1221	HARNPCM002	Pigtail
5404-1224	HARNPCM008	Development Harness
5404-1225	HARNPCM012	Programming Harness
8923-1403	ASMBBOX0801002	Breakout box
5404-1204	HARNINTR025A	Desktop Simulator Front End Harness

SOFTWARE

CONTROLLERS

CONNECTORS & KITS

DEV TOOLS

HARNESSES

SYSTEM COMPONENTS

HCM-0563-048
Hydraulic Control Module

PHYSICAL DIMENSIONS (Drawings and models available upon request.)

147 mm
8.3 mm
30.8 mm
84 mm
58 mm
138.4 mm
153.4 mm

Product Summary

The HCM-0563-048 hydraulic control module is a rugged embedded control system capable of operating in harsh automotive, marine, and off-highway applications.

Thousands of successful marine applications prove the capability of this module design.

Based on a proven microprocessor, the HCM-0563-048 is capable of delivering complex control strategies. The onboard floating point unit and high clock frequency allow software to be developed in shorter times. Dual CAN 2.0B datalinks ensure interoperability with other system components.

The HCM-0563-048 is part of the ControlCore family of embedded controls systems. Software for this module can be created utilizing model-based automatic code generation via Woodward's MotoHawk development suite.

IMPORTANT! Woodward does not warranty this ECM 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 Woodward sales for more information.

Hardware Features

Microprocessor: MPC563, 40MHz
Memory: 512K Flash, 32K RAM (4K overlayable)
16K serial EEPROM
128K parallel EEPROM
Operating Voltage: 8-32VDC
Operating Temperature: -40° to 85° C
Sealed Connectors Operable to 10ft. submerged
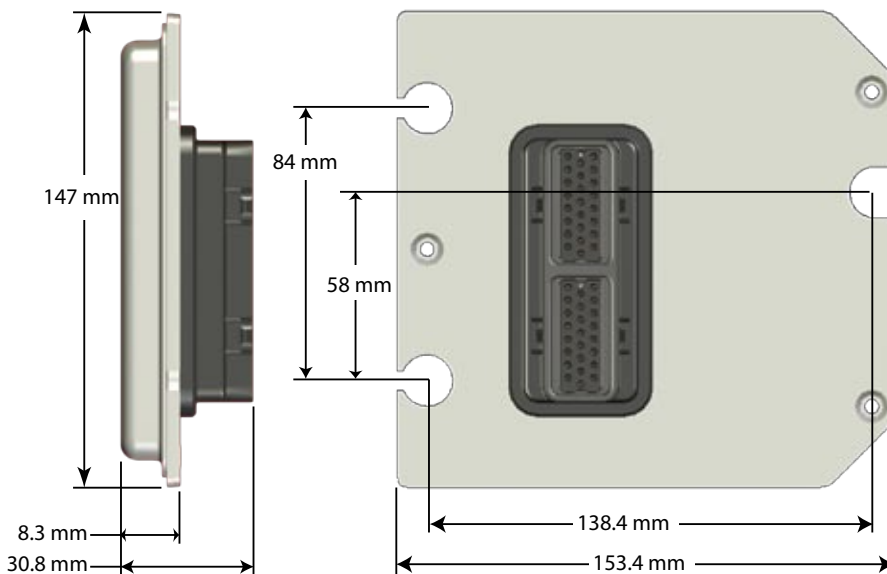
Inputs

Up to 16 Analog Inputs
Up to 6 Discrete/Frequency Inputs
Up to 2 VR/Hall Frequency Inputs
1 Knock/Drive Noise Detector Input
1 Stop Input

Outputs

6 2.5A Low Side Drivers w/Current Feedback
4 3A Low Side Drivers
1 1A EasyLink/Low Side Driver
1 Relay Driver (Main Power)

Datalinks

2 CAN 2.0B Channels
1 EasyLink Channel
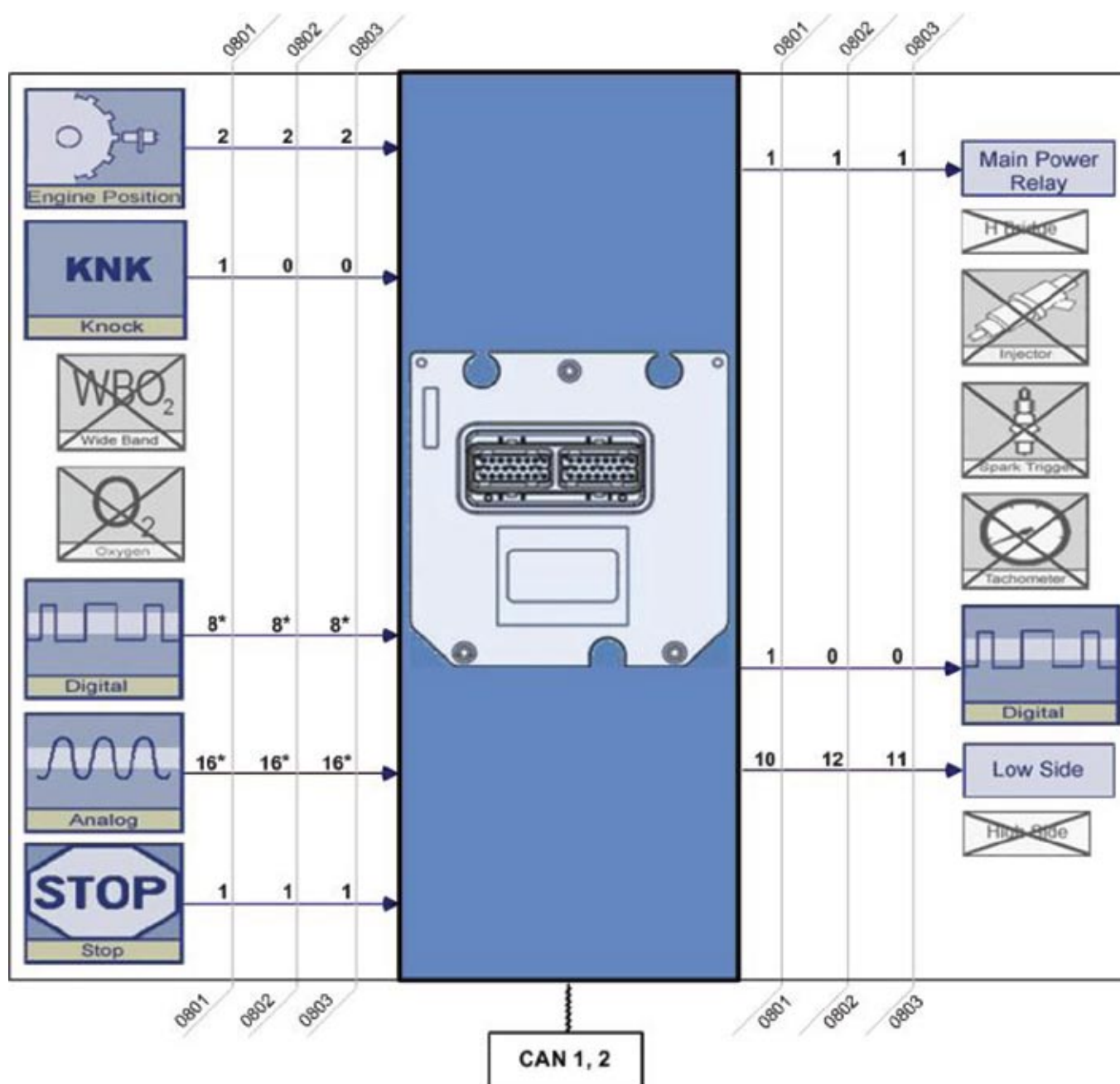
Notes

GHS 3.6 version required

ORDERING INFORMATION

PLATFORM HCM563-48 — ACTIVE CONTROLLERS

Flash Controllers			Calibratible Controllers		
Item No.	w/Mounting Hardware	Controller ID	Item No.	w/Mounting Hardware	Controller ID
1751-6354	8923-1607	HCM05630480801F00	1751-6352	8923-1606	HCM05630480801CP0
1751-6358	8923-1609	HCM05630480802F00	1751-6357	8923-1608	HCM05630480802CP0
1751-6361	8923-1611	HCM05630480803F00	1751-6360	8923-1610	HCM05630480803CP0

HCM563-48 RELATED HARDWARE

Item No.	Reference Number	Description
8923-1407	ASMCON00200	Connector Kit
8996-2150	TOOLCON00800	Crimp Tools
	1/16" punch	Removal Tools
1635-1800	HARNINTR00801	Boot Key
5404-1138	HARNECM022	Boot Cable
5404-1109	HARNECM004D0	Pigtail
5404-1124	HARNECM014	Development Harness
5404-1235	HARNPROG009	Programming Harness
8923-1402	ASMBBOX0481002	Breakout box
5404-1203	HARNINTR024C	Desktop Simulator Front End Harness

PHYSICAL DIMENSIONS (Drawings and models available upon request.)

147 mm

8.3 mm
30.8 mm

84 mm

58 mm

138.4 mm
153.4 mm

Product Summary

The GCM-0563-048 general control module is a rugged embedded control system capable of operating in harsh automotive, marine, and off-highway applications. **Thousands of successful marine applications prove the capability of this module design.**

Based on a proven microprocessor, the GCM-0563-048 is capable of delivering complex control strategies. The onboard floating point unit and high clock frequency allow software to be developed in shorter times. Three CAN 2.0B datalinks ensure interoperability with other system components.

The GCM-0563-048 is part of the ControlCore family of embedded controls systems. Software for this module can be created utilizing model-based automatic code generation via Woodward's MotoHawk development suite.

IMPORTANT! Woodward does not warranty this ECM 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 Woodward sales for more information.

Hardware Features

Microprocessor: MPC563, 40MHz
Memory: 512K Flash, 32K RAM (4K overlayable)
16K serial EEPROM
128K parallel EEPROM (GCM-0563-048-0801-C)
Operating Voltage: 8-32VDC
Operating Temperature: -40° to 105° C
Sealed Connectors Operable to 10ft. submerged

Inputs

Up to 16 Analog Inputs
Up to 7 Discrete/Frequency Inputs
Up to 2 VR/Hall Frequency Inputs
1 Emergency Stop Input

Outputs

2 3A Low Side Drivers w/Current Feedback
4 3A Low Side Drivers
2 2.9A High Side Driver
1 1A EasyLink/Low Side Driver
1 Relay Driver (Main Power)
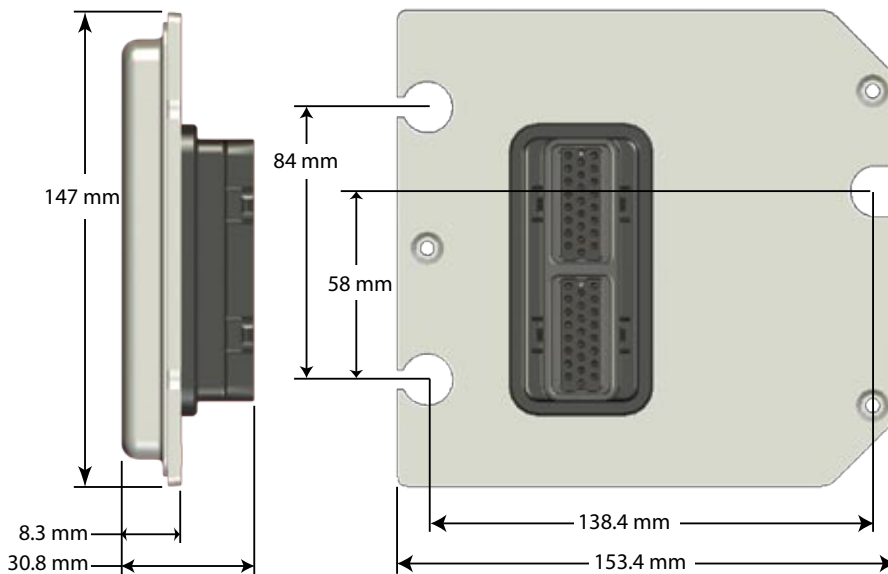1 10A H-Bridge Driver

Datalinks

3 CAN 2.0B Channels
1 EasyLink Channel

Notes

GHS 3.6 version required

ORDERING INFORMATION

PLATFORM GCM563-048 — ACTIVE CONTROLLERS

Flash Controllers			Calibratible Controllers		
Item No.	w/Mounting Hardware	Controller ID	Item No.	w/Mounting Hardware	Controller ID
1751-6326	8923-1591	GCM05630480801F00	1751-6324	8923-1590	GCM05630480801CP0
1751-6332	8923-1593	GCM05630480802F00	1751-6330	8923-1592	GCM05630480802CP0

GCM563-048 RELATED HARDWARE

Item No.	Reference Number	Description
8923-1407	ASMCON00200	Connector Kit
8996-2150	TOOLCON00800	Crimp Tools
	1/16" punch	Removal Tools
1635-1800	HARNINTR00801	Boot Key
5404-1138	HARNECM022	Boot Cable
5404-1109	HARNECM004D0	Pigtail
5404-1124	HARNECM014	Development Harness
5404-1235	HARNPROG009	Programming Harness
8923-1402	ASMBBOX0481002	Breakout box
5404-1203	HARNINTR024C	Desktop Simulator Front End Harness

ECM-0563-048
Engine Control Module

PHYSICAL DIMENSIONS (Drawings and models available upon request.)

147 mm
8.3 mm
30.8 mm
84 mm
58 mm
138.4 mm
153.4 mm

Product Summary

The ECM-0563-048 is a rugged embedded control system capable operating in harsh automotive, marine, and off-highway applications. Based on a proven microprocessor, this engine control module is capable of delivering complex control strategies.

The onboard floating point unit and high clock frequency allow software to be developed in shorter times. The CAN 2.0B datalink ensures interoperability with other vehicle systems.

The ECM-0563-048 is part of the ControlCore family of embedded controls systems. Software for this module can be created utilizing model-based automatic code generation via Woodward's MotoHawk development suite.

IMPORTANT! Woodward does not warranty this ECM 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 Woodward sales for more information.

Hardware Features

Microprocessor: MPC563, 56MHz
Memory: 512K Flash, 32K RAM(24K+4K overlayable)
128K parallel EEPROM (ECM-0563-048-0701-C)
Operating Voltage: 8-16VDC
Operating Temperature: -40° to 105° C
Sealed Connectors Operable to 10ft submerged

Inputs

13 Analog Inputs
2 VR/HallFrequency Inputs

Outputs

4 Low Side Injector Drivers
8 TTL Level Ignition System Outputs
5 High Current Low Side PWM
2 5A H-Bridge PWMs with Current Feedback
Independent Transducer Power Supply
1 Low SideRelay Driver (Main Power)
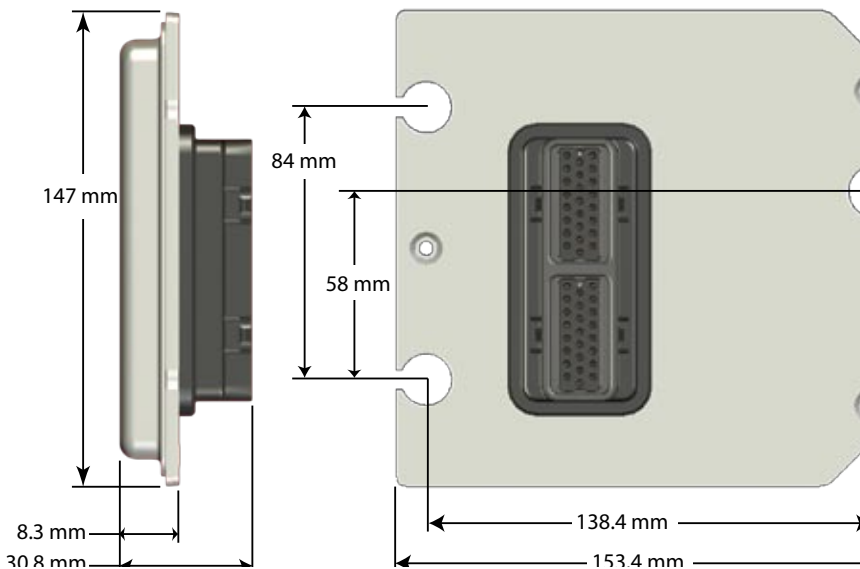
Datalinks

1 CAN 2.0B Channel

Notes

GHS 3.6 version required

ORDERING INFORMATION

PLATFORM ECM563-48 — ACTIVE CONTROLLERS

Flash Controllers			Calibratible Controllers		
Item No.	w/Mounting Hardware	Controller ID	Item No.	w/Mounting Hardware	Controller ID
1751-6407	8923-1565	ECM05630480701F00	1751-6406	8923-1564	ECM05630480701CP1
1751-6410	8923-1568	ECM05630480704F00	1751-6409	8923-1567	ECM05630480704CP2
1751-6068	1751-6110	ECM05630480705F00	1751-6415	1751-6071	ECM05630480705CP0
1751-6417	8923-1571	ECM05630480806F00	1751-6416	8923-1570	ECM05630480806CP0

ECM563-48 RELATED HARDWARE

Item No.	Reference Number	Description
8923-1407	ASMCON00200	Connector Kit
8996-2150	TOOLCON00800	Crimp Tools
	1/16" punch	Removal Tools
	N/A (not required)	Boot Key
5404-1123	HARNECM013	Boot Cable
5404-1109	HARNECM004D0	Pigtail
5404-1142	HARNECM027	Development Harness
5404-1123	HARNECM013	Programming Harness
8923-1402	ASMBBOX0481002	Breakout box
5404-1202	HARNINTR024B	Desktop Simulator Front End Harness

SOFTWARE

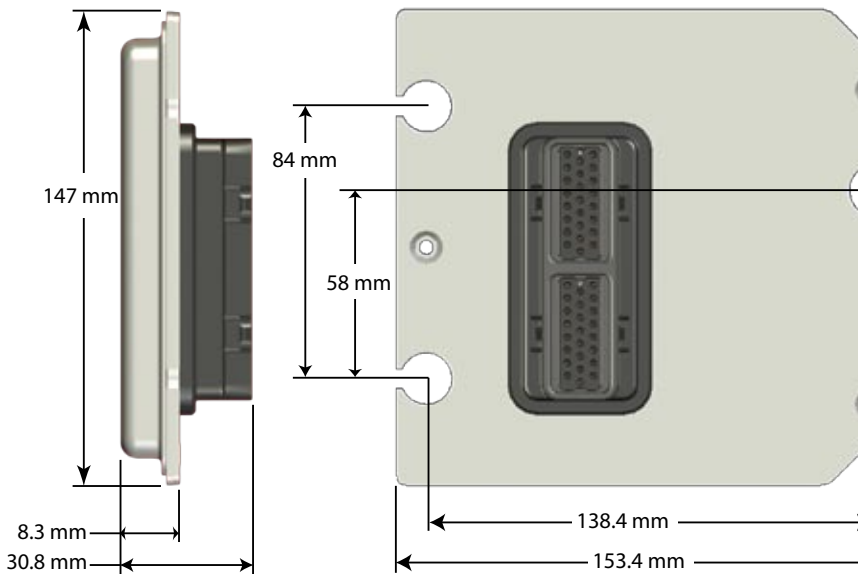CONTROLLERS

CONNECTORS & KITS

DEV TOOLS

HARNESSES

SYSTEM COMPONENTS

ECM-0555-048
Engine Control Module

PHYSICAL DIMENSIONS (Drawings and models available upon request.)

147 mm
8.3 mm
30.8 mm
84 mm
58 mm
138.4 mm
153.4 mm

Product Summary

The ECM-0555-048 engine control family consists of rugged controllers 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 ControlCore™ family of embedded control systems. Woodward's 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.

IMPORTANT! Woodward does not warranty this ECM 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 Woodward sales for more information.

Hardware Features

Microprocessor: Freescale MPC555, 40MHz
Memory: 448K Flash, 26K RAM,
4K serial EEPROM Flash, Except: 0710 - 8K serial EEPROM
Calibritible Memory: 64K parallel EEPROM
Operating Voltage: 8-16VDC
Operating Temperature: -40° to 85° C
(in benchmark marine engine application)
Sealed Connectors Operable to 10 ft. submerged

Inputs*

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

Outputs*

4 Injector Driver Outputs
1 to 4 Electronic Spark Trigger (5V) Ouputs
1 Tachometer Output
4 or 5 Low Side Outputs
1 Main Power Relay Driver Output

Datalinks

1 CAN 2.0B Channel
1 RS-485 Channel

Notes

GHS 3.6 version required

*For I/O information specific to each model refer to the Simple Block Diagram on the following page.
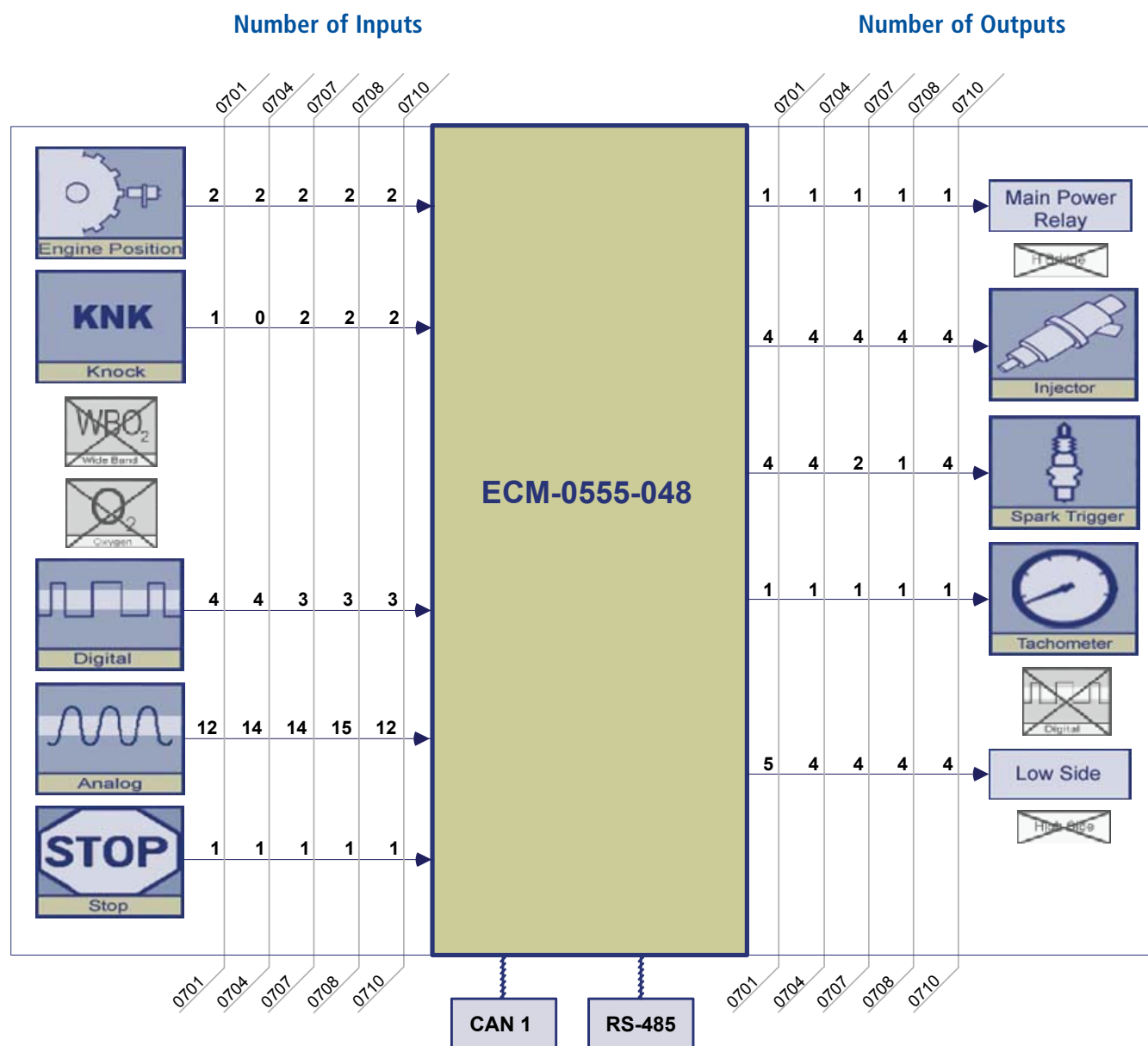
ORDERING INFORMATION

PLATFORM ECM555-48 — ACTIVE CONTROLLERS

Flash Controllers			Calibratible Controllers		
Item No.	w/Mounting Hardware	Controller ID	Item No.	w/Mounting Hardware	Controller ID
1751-6385	8923-1546	ECM05550480701F00	1751-6384	8923-1545	ECM05550480701CP0
1751-6387	8923-1548	ECM05550480704F00	1751-6386	8923-1547	ECM05550480704CP0
1751-6389	8923-1550	ECM05550480707F00	1751-6388	8923-1549	ECM05550480707CP0
1751-6391	8923-1552	ECM05550480708F00	1751-6390	8923-1551	ECM05550480708CP0
1751-6393	8923-1554	ECM05550480710F00	1751-6392	8923-1553	ECM05550480710CP0

ECM555-48 RELATED HARDWARE

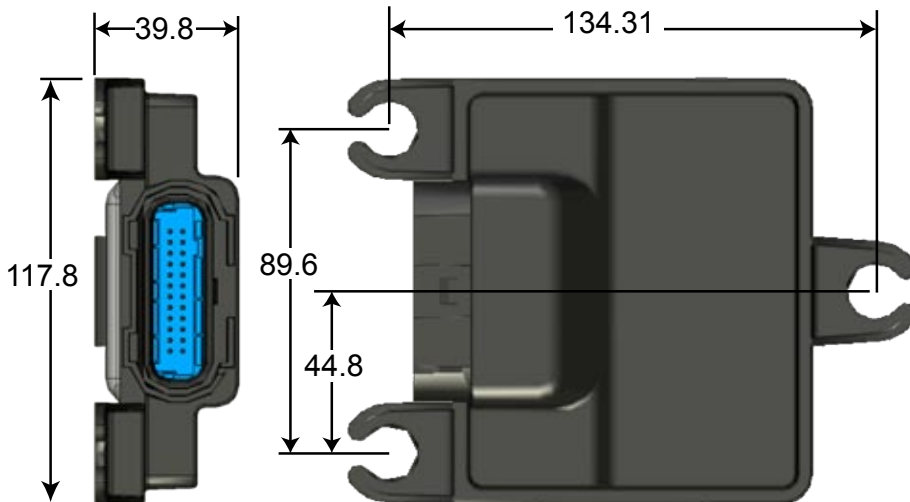| Item No.	Reference Number	Description
8923-1407	ASMCON00200	Connector Kit
8996-2150	TOOLCON00800	Crimp Tools
	1/16" punch	Removal Tools
1635-1800	HARNINTR00801	Boot Key
	N/A (not required)	Boot Cable
5404-1109	HARNECM004D0	Pigtail
5404-1112	HARNECM00700	Development Harness
5404-1122	HARNECM012	Programming Harness
8923-1402	ASMBBOX0481002	Breakout box
5404-1201	HARNINTR024A	Desktop Simulator Front End Harness

SIMPLE BLOCK DIAGRAM

Number of Inputs

Number of Outputs

SOFTWARE

CONTROLLERS

CONNECTORS & KITS

DEV TOOLS

HARNESSES

SYSTEM COMPONENTS

Product Summary

The GCM-OS12-24 is a rugged controller capable of operating in harsh automotive, marine, and off-highway applications. **Hundreds of successful marine applications** prove the capability of this module.

Based on a proven microprocessor, the GCM-OS12-24 is capable of delivering complex control strategies. The 2 CAN 2.0B datalinks ensure interoperability with other vehicle systems. As part of the ControlCore family of embedded controls systems., software for this module can be created utilizing model-based automatic code generation via Woodward's MotoHawk development suite.

IMPORTANT! Woodward does not warranty this ECM 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 Woodward sales for more information.

Hardware Features

Microprocessor: MC9S12DT128, 24MHz
Memory: (MC9S12DT128BMPV) 128K Flash, 8K RAM, 2K EEPROM
Operating Voltage: 8-16VDC
Operating Temperature: -40 to 105 C
Sealed Connectors Operable to 10ft submerged

Inputs

6 Analog Inputs
4 Discrete Inputs

Outputs

4 1.5A Low Side PWM
Multi-function ESTOP (Detect/Assert)
Optional 0-12V LSO (Easy Link Interface)

Datalinks 2 CAN 2.0B Channel

Notes Code Warrior H12 Pro Ed required

PHYSICAL DIMENSIONS (Drawings and models available upon request.)

ORDERING INFORMATION

PLATFORM GCMS12-24 — ACTIVE CONTROLLERS

Flash Controllers		
Item No.	w/Mounting Hardware	Controller ID
1751-6338	8923-1595	GCM0S120240401F00
1751-6340	8923-1596	GCM0S120240402F00
1751-6346	8923-1603	GCM0S120240403F00

PLATFORM GCMS12-24 RELATED HARDWARE

Item No.	Reference Number	Description
8923-1410	ASMCON00600	Connector Kit
8996-2144	TOOLCON00200	Crimp Tools
	Flat screw driver	Removal Tools
	N/A (not required)	Boot Key
5404-1213	HARNMCHI003D0	Boot Cable
5404-1212	HARNMCHI001D0	Pigtail
	N/A (not required)	Development Harness
	N/A (not required)	Programming Harness
8923-1401	ASMBBOX0241002	Breakout box
5404-1200	HARNINTR023B	Desktop Simulator Front End Harness

Product Summary

The ECM-0S12-024 engine control module is a rugged embedded control system capable operating in harsh automotive, marine, and off-highway applications. **Hundreds of successful industrial applications prove the capability of this module.**

Based on a proven microprocessor, the ECM-0S12-024 is capable of delivering complex control strategies. A CAN 2.0B datalink ensures interoperability with other vehicle systems.

The ECM-0S12-024 is compatible with the ControlCore embedded software framework. Software for this module can be created utilizing model-based automatic code generation via Woodward's MotoHawk development suite.

IMPORTANT! Woodward does not warranty this ECM 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 Woodward sales for more information.

Hardware Features

Microprocessor: MC9S12DT128, 24MHz
Memory: (MC9S12DT128BMPV) 128 K Flash, 8K RAM
Operating Voltage: 8-20VDC
Operating Temperature: -40 to 105 C
Sealed Connectors Operable to 10ft submerged

Inputs

Up to 11 Analog Inputs
1 VR Frequency Input

Outputs

3 TTL Level Ignition System Outputs
2 10A Low Side PWM
1 1.0A Tachometer Output
1 5A H-Bridge PWM

Datalinks

1 CAN 2.0B Channel

ORDERING INFORMATION

PLATFORM ECMS12-24 — ACTIVE CONTROLLERS

Flash Controllers			Calibratible Controllers		
Item No.	w/Mounting Hardware	Controller ID	Item No.	w/Mounting Hardware	Controller ID
1751-6426	8923-1576	ECM0S120240801F00	1751-6425	8923-1575	ECM0S120240801CP0
1751-6428	8923-1578	ECM0S120240802F00	1751-6427	8923-1577	ECM0S120240802CP0
1751-6430	8923-1581	ECM0S120240803F00	1751-6429	8923-1580	ECM0S120240803CP0
1751-6432	8923-1583	ECM0S120240804F00	1751-6431	8923-1582	ECM0S120240804CP0

PLATFORM ECMS12-24 RELATED HARDWARE

Item No.	Reference Number	Description
8923-1409	ASMCON00400	Connector Kit
8996-2144	TOOLCON00200	Crimp Tools
	Flat screw driver	Removal Tools
	N/A (not required)	Boot Key
5404-1238	HARNSECM005D1	Boot Cable
5404-1237	HARNSECM004D0	Pigtail
	N/A (not required)	Development Harness
5404-1241	HARNSECM01200	Programming Harness
8923-1401	ASMBBOX0241002	Breakout box
5404-1199	HARNINTR023A	Desktop Simulator Front End Harness

SOFTWARE
CONTROLLERS
CONNECTORS & KITS
DEV TOOLS
HARNESSES
SYSTEM COMPONENTS

8923-1406 / ASMCON00100 - 80 PIN CONNECTOR KIT

Item	Qty	Unit	Item No.	Reference Number	Description
1	1	PC	1635-1726	CONFEML001A00	CONNECTOR FEMALE-24POS
2	1	PC	1635-1727	CONFEML001B00	CONNECTOR FEMALE-24POS
3	1	PC	1635-1728	CONFEML002A00	CONNECTOR FEMALE-32POS
4	100	PC	1602-1080	CONTMFL00200	CONNECTOR TERMINAL FEMALE
5	100	PC	1223-1344	CONPLUG00200	CONNECTOR PLUG
6	2	PC	1634-1010	CONCOVR001A01	CONNECTOR COVER -24 POS
7	1	PC	1634-1011	CONCOVR001B01	CONNECTOR COVER -32POS

8923-1407 / ASMCON00200 - 48 PIN CONNECTOR KIT

Item	Qty	Unit	Item No.	Reference Number	Description
1	1	PC	1635-1726	CONFEML001A00	CONNECTOR FEMALE-24POS
2	1	PC	1635-1727	CONFEML001B00	CONNECTOR FEMALE-24POS
4	100	PC	1602-1080	CONTMFL00200	CONNECTOR TERMINAL FEMALE
5	50	PC	1223-1344	CONPLUG00200	CONNECTOR PLUG
6	2	PC	1634-1010	CONCOVR001A01	CONNECTOR COVER-24 POS

8923-1408 / ASMCON00300 - 128 PIN CONNECTOR KIT

Item	Qty	Unit	Item No.	Reference Number	Description
1	2	PC	1635-1726	CONFEML001A00	CONNECTOR FEMALE-24POS
2	2	PC	1635-1727	CONFEML001B00	CONNECTOR FEMALE-24POS
3	1	PC	1635-1728	CONFEML002A00	CONNECTOR FEMALE-32POS
4	200	PC	1602-1080	CONTMFL00200	CONNECTOR TERMINAL FEMALE
5	100	PC	1223-1344	CONPLUG00200	CONNECTOR PLUG
6	4	PC	1634-1010	CONCOVR001A01	CONNECTOR COVER -24 POS
7	1	PC	1634-1011	CONCOVR001B01	CONNECTOR COVER -32POS

8923-1409 / ASMCON00400 - 24 PIN CONNECTOR KIT

Item	Qty	Unit	Item No.	Reference Number	Description
1	1	EA	1635-1764	CONFEML03500	CONNECTOR FEMALE - 24 PIN
2	30	EA	1602-1101	CONTMFL03400	CONNECTOR TERMINAL FEMALE
3	1	EA	1391-0135	CONSEAL01100	CONNECTOR - WIRE SEAL
4	1	EA	1633-1003	CONSTRN00300	CONNECTOR STRAIN RELIEF RH - 24 PIN
5	1	EA	1010-1116	CONLOCK01300	CONNECTOR LOCK - 24 POS BLACK
6	1	EA	1010-1119	CONLOCK02200	CONNECTOR LOCK - POSITION ASSU

8923-1410 / ASMCON00600 - 24 PIN CONNECTOR KIT

Item	Qty	Unit	Item No.	Reference Number	Description
1	1	EA	1635-1764	CONFEML03500	CONNECTOR FEMALE - 24 PIN
2	30	EA	1602-1101	CONTMFL03400	CONNECTOR TERMINAL FEMALE
3	1	EA	1391-0135	CONSEAL01100	CONNECTOR - WIRE SEAL
4	1	EA	1633-1003	CONSTRN00300	CONNECTOR STRAIN RELIEF RH - 24 PIN
5	1	EA	1010-1119	CONLOCK02200	CONNECTOR LOCK - POSITION ASSU
6	1	EA	1010-1117	CONLOCK01600	CONNECTOR LOCK - 24 POS CLEAR
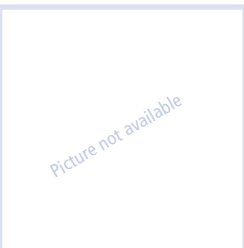
8923-1413 / ASMCON042 - 112 PIN CONNECTOR KIT

Item	Qty	Unit	Item No.	Reference Number	Description
1	2	EA	1634-1012	CONCOVR008	CONNECTOR COVER - 32 PIN MOLEX
2	1	EA	1634-1013	CONCOVR009	CONNECTOR COVER - 48 PIN MOLEX
3	1	EA	1635-1768	CONFEML05100	32 PIN FOR 112 PIN CONTROLLER - BLACK KEY, RIGHT DRESS
4	1	EA	1635-1769	CONFEML05200	48 PIN FOR 112 PIN CONTROLLER -BROWN KEY, RIGHT DRESS
5	1	EA	1635-1771	CONFEML05400	32 PIN FOR 112 PIN CONTROLLER -GREY KEY, LEFT DRESS
6	30	EA	1602-1105	CONTMFL04900	TERMINAL FEMALE - 1.5 FOR 112PIN CONTROLLER
7	100	EA	1602-1106	CONTMFL05000	TERMINAL FEMALE - .63MM FOR 112PIN CONTROLLER

Picture not available

WOODWARD

Phone: 866.588.0494   mcsinfo@woodward.com   www.woodward.com

Crimper - Micropack: 8996-2144 / TOOLCON00200

Crimper - Molex .63mm for 112 Pin: 8996-2158 / TOOLCON016

Crimper - 48/80/128 Pin: 8996-2150 / TOOLCON00800

Crimper - Molex 1.5mm for 112 Pin: 8996-2159 / TOOLCON017

Crimper - Deutsch: 8996-2154 / TOOLCON012

Special Academic Pricing

8996-2154 / TOOLCON012: Deutsch crimpers

Reg price: $249

Promotional price: $189

While supplies last

Ideal for crimping SmartCraft terminals

Purchase also includes 14 and 16 AWG die sets

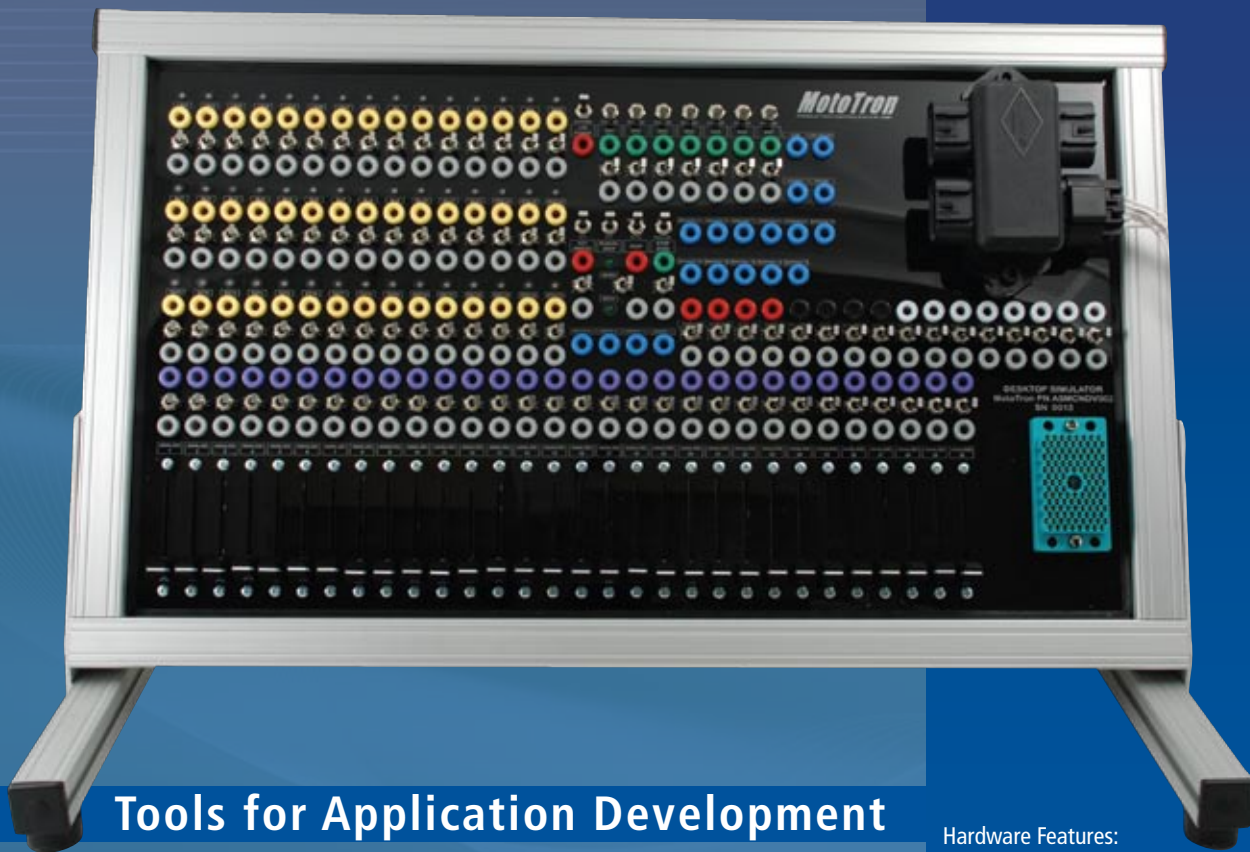| Works with the following Deutsch Stamped and Formed Contacts P/N'S: |
| --- |
| 1060-16-0722 - Size 16 Pin, (Male) 14, & 16 AWG wire |
| 1062-16-0772 - Size 16 Socket, (Female) 14, & 16 AWG wire |
| 1060-16-0622 - Size 16 Pin, (Male) 16 AWG wire |
| 1062-16-0672 - Size 16 Socket, (Female) 16 AWG wire |
| 1060-16-0122 - Size 16 Pin, (Male) 16 AWG wire |
| 1062-16-0172 - Size 16 Socket, (Female) 16 AWG wire |
| 1060-14-0122 - Size 16 Pin, (Male) 14, & 16 AWG wire |
| 1062-14-0172 - Size 16 Socket, (Female) 14, & 16 AWG wire |

SOFTWARE · CONTROLLERS · CONNECTORS & KITS · DEV TOOLS · HARNESSES · SYSTEM COMPONENTS

DESKTOP I/O SIMULATOR

Tools for Application Development

The ASMCNDV002 Desktop I/O Simulator is a powerful development tool designed to easily stimulate signals to the controller and measure signals generated by the controller. The desktop simulator is capable of working with any of our MotoTron Control Solutions electronic control modules. It is a must have tool for application developers to easily verify functionality without the expense of dedicated HIL test stands or expensive test cells.

The I/O simulator provides access points for all signals, making it easy to connect oscilloscopes, voltmeters, current meters or other lab devices. In addition, CAN and serial links are available for easy databus connections. The I/O simulator requires the purchase of a module specific companion harness. You must also supply a DC power source. We recommend outfitting each application developer with this simulator, harness, and a dedicated ECM. To complete your development toolkit, breakout boxes are also available, which insert into your production harness allowing measurement and opening of each signal. The desktop simulator and breakout boxes are highly recommended as a part of every application developer's toolkit.

Hardware Features:

Aluminum frame, 70° mounting for ease of use

Scratch-free rubber feet

Over 200 banana jacks for I/O

30 Channels of Analog Input (switchable - On / Off)

45 Channels of Low or High Side Output (switchable - On / Off)

3 CAN Channels (switchable - On / Off)

1 RS485 Channel (switchable - On / Off)

8 Digital Inputs (switchable - On / Off or pulled High / Low)

10 Power and Ground Channels (switchable - On / Off) , including ECM Input Voltage+/-, XDRP, XDRG, MPRD, DRVP, DRVG, and Key Switch

4 Channels of Knock Sensor Inputs

4 Channels of Encoder Inputs

11 Channels of Miscellaneous Banana Inputs

BREAKOUT BOXES

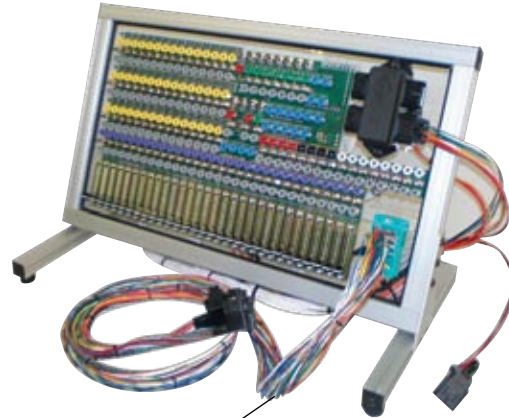24 Pin Breakout Box

48 Pin Breakout Box

80 Pin Breakout Box

112 Pin Breakout Box

WOODWARD

ORDERING INFORMATION

The Desktop Simulator connects to your module via a pre-built front end harness. (Sold separately.) Select the appropriate harness to fit your controller.

8909-1043 / ASMCNDV002 - Front End Harnesses

CONTROLLER	FRONT END HARNESS	
	Item No.	Reference Number
ECMS12-24	5404-1199	HARNINTR023A
GCMS12-24	5404-1200	HARNINTR023B
GCM565-24	5404-1199	HARNINTR023A
ECM555-48	5404-1201	HARNINTR024A
ECM563-48	5404-1202	HARNINTR024B
GCM563-48	5404-1203	HARNINTR024C
HCM563-48	5404-1203	HARNINTR024C
ECM555-80	5404-1204	HARNINTR025A
ECM565-128	5404-1206	HARNINTR027A
ECM5554-112	5404-1205	HARNINTR026A

Front End Harness sold separately

Harness Breakout Boxes

Performing ECM signal measurement and failure testing without modifying the harness can be difficult and time consuming. Woodward's ECM breakout boxes are ruggedized harness inserts designed to make this painful job easy.

Breakout boxes were designed by Woodward's own application developers to assist troubleshooting and failure mode testing activities and are a highly recommended part of every developer's toolkit. The family of breakout boxes covers the entire range of Woodward's MotoTron Control Solutions modules.

The breakout box plugs into the existing harness connectors and ECM, but also provides an extension with measurement points and circuit breaking bars. Each pin to the ECM can be probed, open circuited, or connected to any other signal.

Each breakout box assembly comes with an Expander toolkit (CONKIT012C) of patch cables, shorting bars, and banana jacks.

ORDERING INFORMATION

Select the appropriate breakout box assembly to fit your controller.

CONTROLLER	BREAKOUT BOX ASSEMBLY	
	Item No.	Reference Number
ECMS12-24	8923-1401	ASMBBOX0241002
GCMS12-24	8923-1401	ASMBBOX0241002
GCM565-24	8923-1401	ASMBBOX0241002
ECM555-48	8923-1402	ASMBBOX0481002
ECM563-48	8923-1402	ASMBBOX0481002
GCM563-48	8923-1402	ASMBBOX0481002
HCM563-48	8923-1402	ASMBBOX0481002
ECM555-80	8923-1403	ASMBBOX0801002
ECM565-128	8923-1405	ASMBBOX1281002
ECM5554-112	8923-1404	ASMBBOX1121002

ACCESSORIES

Break Out Box Assembly Kits

Small

8923-1540 / CONKIT012A

Large

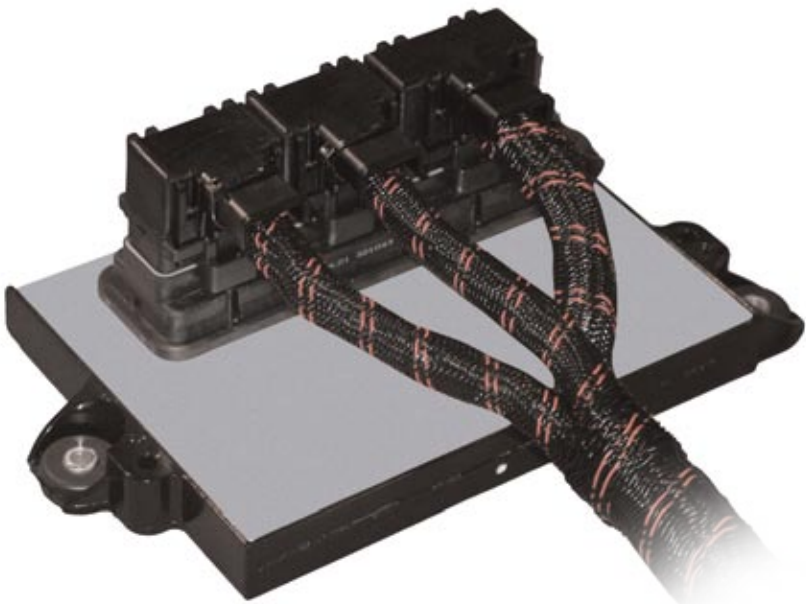8923-1541 / CONKIT012B

Expander

8923-1542 / CONKIT012C

Mini Plug Kit

8923-1543 / CONKIT012D

SOFTWARE · CONTROLLERS · CONNECTORS & KITS · DEV TOOLS · HARNESSES · SYSTEM COMPONENTS

Product Summary

Development harnesses are specifically designed for each respective electronic control module, and are ready-made for application development. The harnesses provide labeled wiring to all ECM pins — I/O, power, ground, etc., along with 10-pin connectors for module programming via CAN, and standard power, ground, and keyswitch connections.

Hardware Features

18 gauge wire
Rated for use in harsh industrial and automotive environments
Includes a main power relay, and fused power connection

ECM555-48 PIN Development Harness:
5404-1112 / HARNECM00700

ECM555-80 Development Harness:
5404-1224 / HARNPCM008

HCM563-48 PIN; GCM563-48 PIN Development Harness:
5404-1124 / HARNECM014

ECM565-128 PIN Development Harness:
5404-1219 / HARNP12800200

ORDERING INFORMATION

Select the appropriate development harness to fit your controller.

Module Platform	Development Harness	
	Item No.	Reference Number
ECMS12-24	N/A	N/A
GCMS12-24	N/A	N/A
GCM565-24	5404-1211	HARNISDL00100
ECM555-48	5404-1112	HARNECM00700
ECM563-48	5404-1142	HARNECM027
GCM563-48	5404-1124	HARNECM014
HCM563-48	5404-1124	HARNECM014
ECM555-80	5404-1224	HARNPCM008
ECM565-128	5404-1219	HARNP12800200
ECM555x-112	5404-1216	HARNP112002

WOODWARD

Product Summary

Pigtail harnesses provide dedicated labeled wires to all pins — I/O, power, ground, etc. of the respective electronic control module model, and are indispensable for wiring in prototype development and testing efforts.

Hardware Features

18 gauge wire
Rated for use in harsh industrial and automotive environments
Available in a variety of pre-cut harness wire lengths

ECMS12-24 HARNESS - 12' PIGTAIL:
5404-1237 / HARNSECM004D0

GCMS12-24 HARNESS - 12' PIGTAIL:
5404-1212 / HARNMCHI001D0

ECM555x-112 HARNESS - 12' PIGTAIL:
5404-1215 / HARNP112001

ECM, GCM, HCM - 48 HARNESS - 12' PIGTAIL:
5404-1109 / HARNECM004D0

ECM555-80 HARNESS - 12' PIGTAIL:
5404-1221 / HARNPCM002

ECM565-128 HARNESS - 12' PIGTAIL:
5404-1218 / HARNP12800100

ORDERING INFORMATION

Select the appropriate pigtail harness to fit your controller.

Module Platform	Pigtail	
	Item No.	Reference Number
ECMS12-24	5404-1237	HARNSECM004D0
GCMS12-24	5404-1212	HARNMCHI001D0
GCM565-24	5404-1237	HARNSECM004D0
ECM555-48	5404-1109	HARNECM004D0
ECM563-48	5404-1109	HARNECM004D0
GCM563-48	5404-1109	HARNECM004D0
HCM563-48	5404-1109	HARNECM004D0
ECM555-80	5404-1221	HARNPCM002
ECM565-128	5404-1218	HARNP12800100
ECM555x-112	5404-1215	HARNP112001

SOFTWARE

CONTROLLERS

CONNECTORS & KITS

DEV TOOLS

HARNESSES

SYSTEM COMPONENTS

ECMS12-24 Boot Cable Harness:
5404-1238 / HARNSECM005D1

Product Summary

Errors in configuration, logic or other electronic control module programming made during application development efforts can cause a temporary loss of CAN communications with the module under development. MotoHawk provides the must-have boot keys and cables to remedy this occurrence. Each designed to match the boot connection requirements of the particular ECM model type.

Product Functions

Boot keys provide a signal to the STOP pin of the ECM.
Boot cables tie certain analog inputs together to a specific signal level.

Order the recommended item(s) for your ECM model.

GCMS12-24 Boot Cable Harness:
5404-1213 / HARNMCHI003D0

ECM563-48 Boot Cable Harness:
5404-1123 / HARNECM013

Boot Connector:
1635-1800 / HARNINTR00801

GCM565-24 Boot Adaptor:
5404-1265 / HARNADPT004

ORDERING INFORMATION

Select the appropriate boot cable harness, boot connector, and boot key to fit your controller.

Module Platform	Boot Key		Boot Cable	
	Item No.	Reference Number	Item No.	Reference Number
ECMS12-24	N/A	N/A	5404-1238	HARNSECM005D1
GCMS12-24	N/A	N/A	5404-1213	HARNMCHI003D0
GCM565-24	N/A	N/A	5404-1265	HARNADPT004
ECM555-48	1635-1800	HARNINTR00801	N/A	N/A
ECM563-48	N/A	N/A	5404-1123	HARNECM013
GCM563-48	1635-1800	HARNINTR00801	5404-1138	HARNECM022
HCM563-48	1635-1800	HARNINTR00801	5404-1138	HARNECM022
ECM555-80	1635-1800	HARNINTR00801	N/A	N/A
ECM565-128	1635-1800	HARNINTR00801	N/A	N/A
ECM555x-112	1635-1800	HARNINTR00801	N/A	N/A

WOODWARD

ECMS12-24 Programming Harness:
5404-1241 / HARNSECM01200

GCM565-24 Programming Harness:
5404-1211 / HARNISDL00100

ECM555-80 Programming Harness:
5404-1225 / HARNPCM012

ECM555-48 Programming Harness:
5404-1122 / HARNECM012

Product Summary

Programming harnesses are specifically designed for programming the respective Woodward electronic control module model via CAN connection and the 10-pin connector. Use with the appropriate CAN-to-PC cable (Kvaser, etc.) connected from the PC USB port to the 10-pin connector junction.

ORDERING INFORMATION

Select the appropriate programming harness to fit your controller.

Module Platform	Programming Harness	
	Item No.	Reference Number
ECMS12-24	5404-1241	HARNSECM01200
GCMS12-24	N/A	N/A
GCM565-24	5404-1211	HARNISDL00100
ECM555-48	5404-1122	HARNECM012
ECM563-48	5404-1123	HARNECM013
GCM563-48	5404-1235	HARNPROG009
HCM563-48	5404-1235	HARNPROG009
ECM555-80	5404-1225	HARNPCM012
ECM565-128	N/A	N/A
ECM555x-112	5404-1217	HARNP112003

WOODWARD

www.woodward.com