NEW

CoreTek™ Controllers How To Guide

www.hydraforce.com
HydraForce Coretek™ controllers are programmable, multifunction, mobile machinery ECUs that relate a specific input or inputs to a user selectable output or outputs. Because they are programmable, using CoDeSys software, Coretek ECUs provide flexibility in the selection of logic routines, value calculations and system operating limits. They can be used to electronically control speed, direction, force, and to sequence multiple machine functions.

The user friendly CoDeSys software allows for the modeling of multiple variables in order to establish output values, to enable or disable outputs, or to adjust parameters in order to optimize performance, controllability and machine safety. The controller will interface with sensors, displays, operator input devices (such as joysticks), and other system devices connected directly or through an addressable CAN communications bus. Outputs are also user configurable, allowing flexibility in system construction including the ability to drive proportional and or on/off valve coils typically used in machine control circuits.

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**CoreTek™ Controllers Ratings and Specifications**

**POWER REQUIREMENTS:**
- Operating Voltage: 9 to 30 VDC (1 Watt idle power)
- Operating Current: 13 Amp max. continuous current
- Over-Voltage: 34 VDC maximum

**PROCESSING and MEMORY:**
- Microprocessor: 16-bit at 40 MHz;
- Flash ROM: 254 Kbyte
- SRAM: 256 Kbyte; EEPROM: 6200 bytes

**COMMUNICATION:**
- (2) ISO CAN 2.0B Interfaces: CANopen, J1939, or user-programmed

**ENVIRONMENTAL RATINGS:**
- Operating Temperature: –40°C to +70°C (–40 to 158°F)
- Storage Temperature: –50°C to +85°C (–58°C to 185°F)
- Water Resistance: meets IP67 standards
- Radiated Immunity: 20 to 2000 MHz at 30 V/m
- Vibration: 3.5Gms random from 10 to 500 Hz
- Shock: 50g peak

**SYSTEM REQUIREMENTS:**
- Operating system: Windows 2000, XP, or Vista
- Processor: 1 GHz Pentium level processor recommended
- Memory: 2 GB hard disk space, 1 GB RAM
- Screen resolution: 1024 x 768
- Hardware: USB to CAN adaptor (Kvaser, Vector, or IXXAT)
**Model ECU-0710; Part No. 4000351**
The ECU-0710 control can be set for up to 20 inputs, consisting of digital, pulse, current measuring feedback and analog. A total of seven outputs configurations can be set, including six PWM or digital high-side drivers and a single low-side driver.

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**Model ECU-2032; Part No. 4000355**
The ECU-2032 control offers as many as 52 inputs and 20 outputs consisting of up to eight PWM or 20 digital high-side drivers.

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**Model ECU-2415; Part No. 4000352**
The ECU-2415 control can be set for as many as 39 digital, pulse, current measuring feedback and analog inputs along with 24 outputs consisting of up to 24 PWM or digital high-side drivers.

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**Model ECU-2820; Part No. 4000356**
The ECU-2820 control offers as many as 52 inputs and 28 outputs consisting of up to 24 PWM or digital high-side drivers and up to four digital low-side drivers.

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Complete technical information and New Products at [www.hydraforce.com](http://www.hydraforce.com)
CoDeSys software, version 2.3, is used to program the CoreTek controllers. This is a general market software package licensed by 3S-Smart Software Solutions of Germany. It is available for download (www.3S-software.com) at no charge to the user. It is non-exclusive and offers a variety of programming structures in order to tailor its use to the user’s experience. A built-in compiler translates the user program to machine code, which is then downloaded to the controller using the HydraForce Backbone™ Programming Tool. The Backbone™ Tool is the interface between the CoDeSys program and the CoreTek controller.

Also available on the HydraForce Electronics Portal at www.hydraforce.com, is the Impulse™ Service Tool. The service tool provides diagnostics aids and the ability to adjust settings and parameters as defined by the programmer, but it does not have the ability to change program structure or operating logic.

Software development and/or training can be arranged through the HydraForce representative. No special programming experience is required, however, users must be experienced in system application disciplines and be knowledgeable in machine operating requirements. Typically the training is conducted using an example project. The project should include definition of desired operating characteristics, input and output device specifications, as well as multi-function, interaction and safety requirements.

CAN Communications

CAN bus is an abbreviation for Controlled Area Network which is typically used for vehicle control systems. The bus structure allows for the linking of multiple devices on a common network much like a land line telephone system. Rather than wiring each component individually to other components in the circuit, a shared 3-wire set connects all system components to a master controller. Wiring complexity is greatly reduced, as is material cost, installation labor, complexity, weight, etc.

Each CAN device has an address (like a phone number) which allows the master controller to send and/or receive messages to or from each networked component. Communication protocol is set by the CAN bus standard. J1939 is one of the standards which establish the method by which components address each other. Specific coding and communication structures are defined within the standard. There are other standards, such as CAN open which can also be supported by the CoreTek controllers, along with user-defined CAN messages.
Development and Application Process

Developing an application for the Coretek controller involves defining the customer requirements in these key areas:

a. Describe vehicle functions and corresponding operator inputs.

b. Define logic and safety requirements
c. Define operator controls i.e. joysticks, push buttons, potentiometers, etc.
d. Define feedback devices i.e. sensors
e. Define outputs – hydraulic circuit, displays, lights, etc.
f. Define set-up adjustments and data records for trouble shooting. What parameters should be dealer or factory adjustable?


- If distributor or customer program development is intended, contact HydraForce for training and applications support.
- If HydraForce will provide programming, define software parameters on the PPDE form.

Preliminary software development costs, bill-of-material, and timeline will be provided based upon the PPDE input.

Following acceptance of the project definition, HydraForce will prepare an engineering specification document (SRS – System Requirements Specification) which will detail the requirements and expectations of the system and will guide software development.

System development begins with customer sign-off of the SRS. The project is completed when the specifications defined in the SRS are met. Revisions to the specification require PPDE and SRS document revision, and can potentially affect cost, timing and materials.
Controllers and Communications Adapter

1) Controller Part Numbers
   ECU-0710 - unflashed (Part No. 4000351)
   ECU-0710S - unflashed (Part No. 4000357)
   ECU-2415 - unflashed (Part No. 4000352)
   ECU-2032 - unflashed (Part No. 4000355)
   ECU-2820 - unflashed (Part No. 4000356)

   Special part number required for pre-programmed ECUs.

   Other HydraForce components may be included as part of the system (EVDR drivers, sensors, displays, etc.).
   Contact electronicsupport@hydraforce.com for additional information.

2) Communications Adapter
   The Kvaser USB to CAN adapter (4000371) is used to connect the ECU to the PC. The adapter sends program data from the user’s PC on the CAN bus to the controller, for programming and diagnostics.

3) Connectors
   The 4000363 AmpSeal 8-pin connector body inserts into the ECU from the adapter providing the CAN connection to the controller pins.

NOTE: Start-up Kit 4209060 is available for initial development.
   The kit includes:
   ECU-0710 (Part No. 4000351)
   USB to CAN Adapter (Part No. 4000371)
   8-pin AmpSeal Connector (Part No. 4000363)
   23-pin AmpSeal Connector - Grey (Part No. 4000361)
   36 Connector Sockets - Gold (Part No. 4000364)
System Connections

The ECU connectors allow connection of a customer-supplied vehicle wiring harness to the ECU. The wiring order of the harness is defined by the pin-out diagram created as part of software development by the programmer.

a. The 8-pin AmpSeal connector body is Part No. 4000363. This connector provides power and CAN communications.

b. The Grey 23-pin AmpSeal connector body is Part No. 4000361. This connector provides input and output communications to the system.

c. The ECU-2415, 2032 and 2820 use additional connector bodies to support the additional input and output capabilities of the larger controllers.
   - Blue AmpSeal 23-pin, Part No. 4000361
   - Black 23-pin AmpSeal Part No. 4000360

d. Sealing plugs for unused cavities in the connector are also available. (Part No. 4000365). Package of 100 (Part No. 4000370.)

e. Connector sockets are available in a package of 100 as Part No. 4000369. The gold socket inserts into the body, providing the receptacle for the mating pin.
Accessories

1) A Shock Cover Kit is available as Part No. 4206820.

2) A ECU Measurement Adapter Part No. 4000372 is available for diagnostics. The adapter plugs into the ECU and the connector from the vehicle wiring harness plugs into the other end. The box allows access to each of the wired connections in the harness for measurement and diagnostics.

CAN bus Bridge

The CAN bus consists of a 3-wire set which connects all input and output devices to a common communications network. In order to splice individual devices into the common network, a bridge connection must be created for each device. This bridge consists of the following Deutsch items.

1) Y-Splitter DT04-3P P007 (HydraForce Part No. 4001917)
2) Termination 120Ω Resistor DT06-3S-PP01 (HydraForce Part No. 4001918)
3) Connector DT06-3S (HydraForce Part No. 4001952)
HydraForce valves meet RoHS environmental requirements restricting the use of cadmium, quick silver, lead hexavalent chrome, polybrominated biphenyl (PPB) or polybrominated diphenyl Ester (PPDE) in products, components and packing materials. All HydraForce products meet requirements limiting the use of hazardous materials as indentified in OSHA Standard 1910.1200(g).

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