



CURTIS

Motor Controllers



# ACF2-C

## AC Induction Motor Controller and DC Pump System Controller



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## The Ultimate Class III pedestrian Truck Combi Control System: Superb Performance and Value

The Curtis Model AC F2-C is an Integrated AC Traction & DC Pump System Controller. This AC F2-C motor controller (inverter) combined with a Half bridge DC hydraulic pump and proportional valve control system uses dual high performance ARM Cortex microprocessors in a compact, package to deliver unmatched performance and a very flexible feature set.

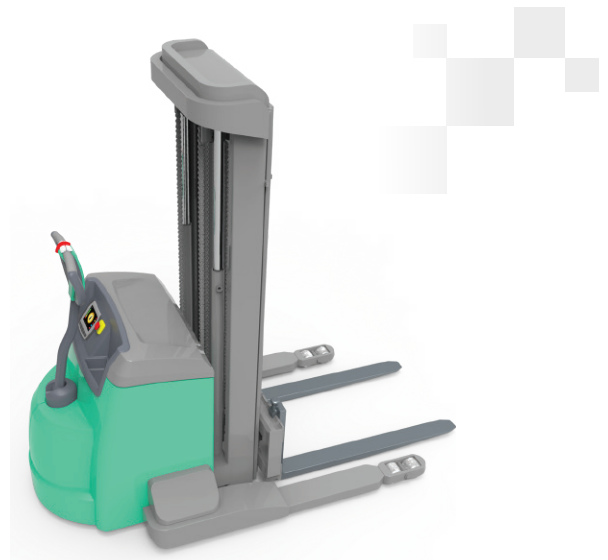
Model AC F2-C is fully optimized for use as a Combi traction and hydraulic controller on 1.0 ton-2.0 ton class III pedestrian-operated powered pallet and stacker trucks. It provides vehicle designers with the ability to fully define and control the detailed dynamic performance of their vehicle's drivetrain and hydraulic pump system, and also provides comprehensive vehicle management and CAN master capabilities. Model AC F2-C is also suitable for traction and hydraulic pump control on other types of battery powered vehicles such as the small aerial scissor lift platforms. Together with the new Curtis model 3140 CAN LCD display and the new user-friendly Curtis Integrated Toolkit, the Curtis model AC F2-C is the ultimate Class III truck control system.

### FEATURES

- ▶ High efficiency, field-oriented motor control algorithms for AC Induction.
- ▶ Advanced motor control for maintaining optimal performance at all operating conditions.
- ▶ Provides real-time motor torque and power estimates for vehicle level power optimization
- ▶ Fully integrated half bridge hydraulic pump controller that is configurable for various hydraulic plumbing layouts.
- ▶ Compact, rugged housing with very small 'footprint' for its power rating.
- ▶ Heavy duty M6 busbars for motor and battery connectors.
- ▶ Built-in fuse stud for hassle free mounting of fuse.
- ▶ Sealed, 35-pin AMPseal I/O Connector.
- ▶ Impervious to most oils, solvents, degreasers and other chemicals often encountered by industrial vehicles.
- ▶ IP65 environmental protection as per IEC 60529.
- ▶ Exceeds latest global conformance requirements for functional safety, electrical safety and EMC.
- ▶ CE marked as a programmable safety device.
- ▶ UL583 Pending.

### Motors

- ▶ Easily configured to work with any AC induction motor (dependent on installed software.)
- ▶ Improved motor auto-characterization setup allows simple on-truck pairing with different Induction motor types.
- ▶ Comprehensive library of induction motor types stored in controller memory.
- ▶ Variable speed half-bridge DC pump output provides superior regulation of pump motor speed and current demand.





## FEATURES continued

### Get More Out of Your Battery—Regardless of the Technology

- ▶ High-efficiency means more of your battery's energy is converted to motor output power.
- ▶ Fully configurable over-and under-voltage protection parameters.
- ▶ Wide operating voltage range allows use with the latest cell chemistries such as lithium ion.
- ▶ Configurable CANbus and VCL allow easy integration with the BMS (Battery Management Systems) typically found on Lithium battery packs.

### Powerful, High Performance Dual Microprocessors

- ▶ Dual-micro architecture achieves up to PL=D, category 2 functional safety under EN ISO 13849-1 / EN1175-1:1998+A1:2010.
- ▶ Ultra-fast processor speeds allows highly accurate control and regulation of voltage, frequency and current.

### Customize Your Vehicle with VCL

- ▶ The Curtis VCL (Vehicle Control Language) allows Curtis AC motor controllers to perform as 'vehicle managers' eliminating the need for costly, additional system controllers.
- ▶ With model AC F2-C, Curtis introduces several significant VCL enhancements:
  - Increased CAN master capabilities.
  - Nearly double the VCL code execution speed.
  - Plentiful on-board memory supports large, complex vehicle application programs (VCL).
  - New output driver control modes, arrays, trigonometry and other complex math functions.

### Highly Flexible I/O

- ▶ All I/O pins are multi-function, and can be configured to provide up to:
  - 23 digital Inputs.
  - 13 Analog Inputs.
  - 2 potentiometer sources.
  - 7 output drivers, including proportional valve driver.
  - 2 Quadrature encoder input.
  - +5V and +12V external power (200mA).

### Comprehensive CAN Master Capabilities

- ▶ Two Independent CAN ports. Each port can run different rates and protocols, with full CANopen and/or J1939 compatibility. Perfect for hybrid vehicles or to bridge CANopen ports at different bit rates.
- ▶ 'Plug and Play' support for Curtis CAN displays and a variety of CAN tiller heads from leading manufacturers FREI and REMA.
- ▶ Fully compliant with CANopen protocol DS301 profile.
- ▶ Capable of acting as 'CAN interpreter' allowing 3rd party CAN devices with differing profiles to work on the same CAN network.

### Improved Diagnostics

- ▶ Integrated, high visibility Status LED with simplified flash code sequence for at-a-glance system troubleshooting.
- ▶ Dynamic throttle safety checking for increased safety with analog throttle commands.
- ▶ Thermal cutback, warning, and automatic shutdown provide protection to motor and controller.
- ▶ Improved error logging and fault history tables with CAN Emergency Messages.

### CAN-based Programming

- ▶ Model AC F2-C is programmable directly over the CANbus. This allows simpler 'vehicle level' communication with many of the CAN-based service tools in use by the major industrial truck manufacturers worldwide, or significantly, allows use of the Curtis Integrated Toolkit of development tools.





## SYSTEM ACCESSORIES



### Curtis Model 3140

A cost-effective, CAN-based LCD vehicle status display in a rugged 52mm diameter housing is the ideal partner to model AC F2-C for use on Class III powered pallet truck applications.

- ▶ Large, easy-to-read 16-segment format LCD.
- ▶ Battery Discharge Indicator, Service (Hours) Counter and Diagnostic/Message Center functions.
- ▶ Sealed to IP65 front, IP54 rear.
- ▶ 12–48V nominal operating voltage range.
- ▶ CE compliant, UL583 recognized component.
- ▶ Optional backlight and heater.



### The Curtis Integrated Toolkit

A fully integrated suite of development and diagnostic tools for use on CAN systems using Curtis and other 3rd party CAN-based products. It is comprised of the following tools that run in a shared environment:

- ▶ **Launch Pad**  
Starting point and project editor.
- ▶ **Programmer**  
Similar in function to the 1314.
- ▶ **TACT**  
Improved version of the stand-alone oscilloscope/datalogging tool.
- ▶ **CAN Monitor**  
CAN data 'sniffer' and debugging tool.
- ▶ **VCL Studio**  
Editor and compiler for VCL software.
- ▶ **Menu Editor**  
Tool to create and modify programming menus.
- ▶ **Pack & Flash**  
Downloader tool to load you software into the CAN device.

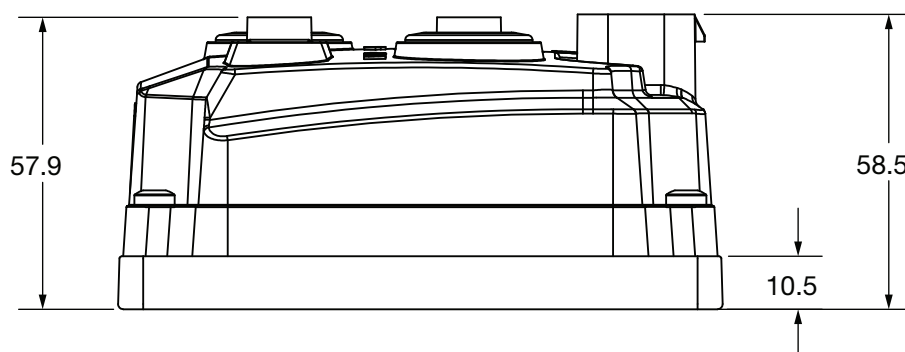
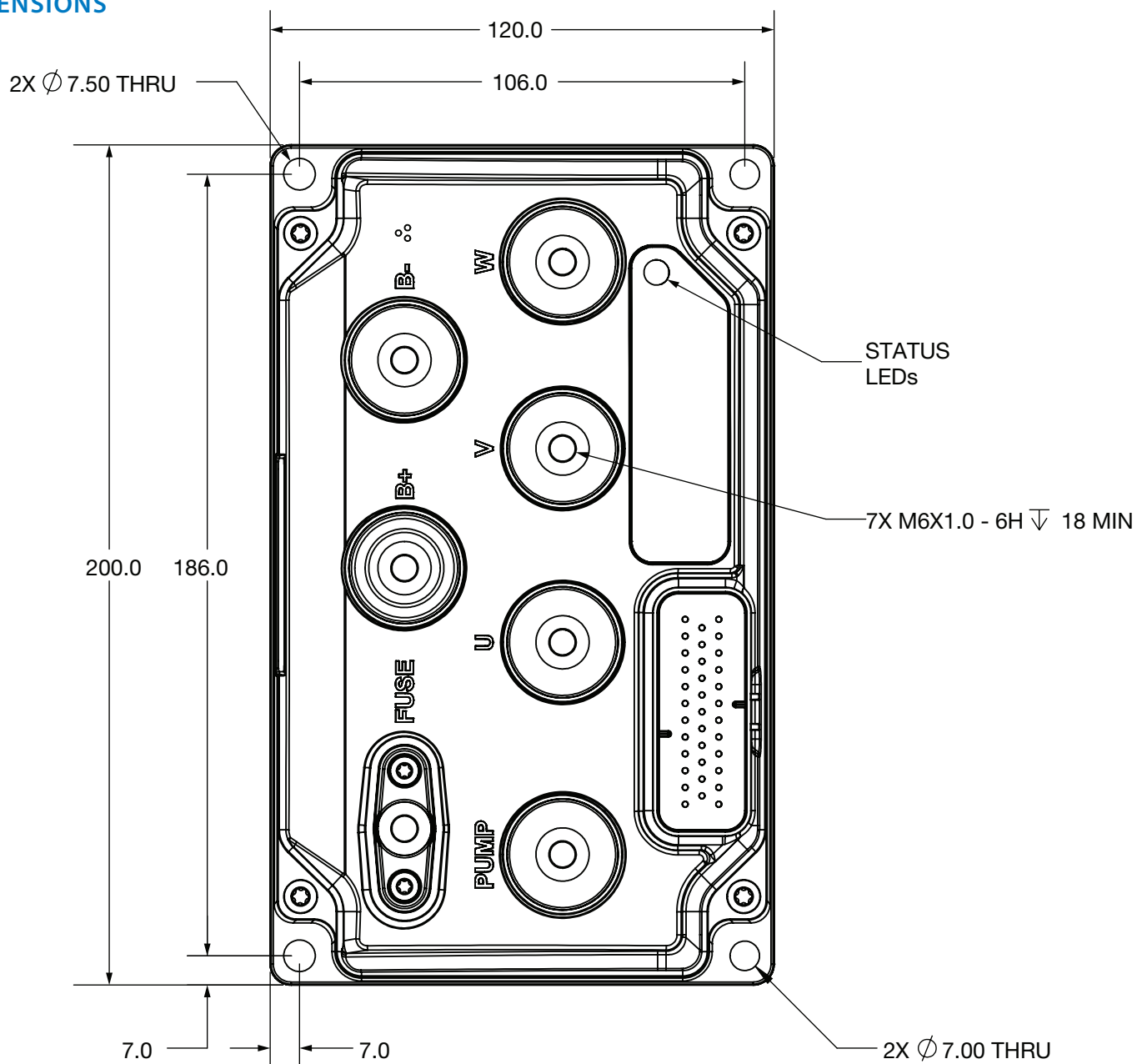
The Curtis Integrated Toolkit is compatible with many leading USB>CAN interface dongles from Peak, Kvaser, iFAC, Sontheim etc. Contact your local Curtis Sales office for further information.

## MODEL CHART

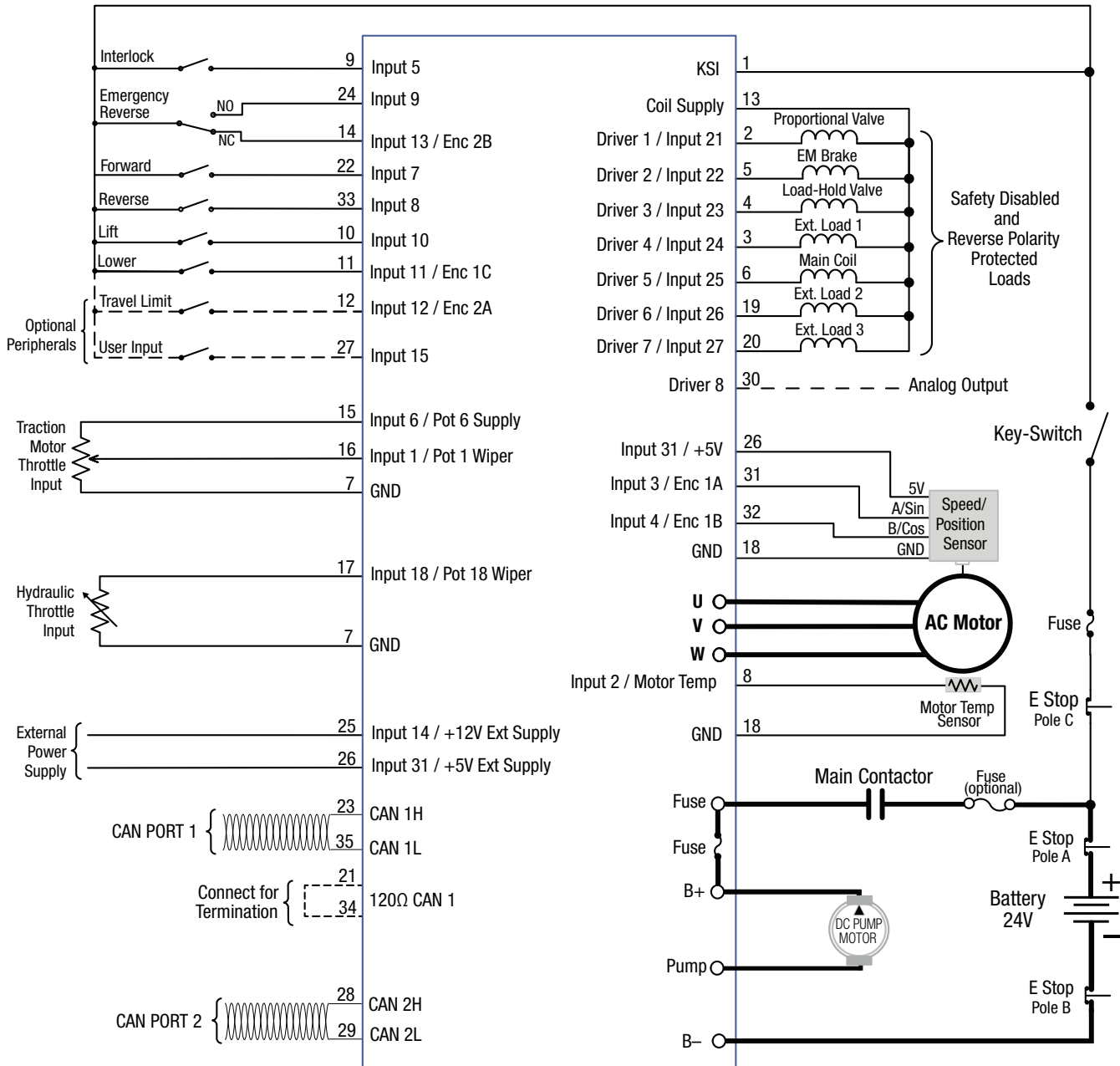
Model Number	Nominal Battery Voltage	Traction Max Current [S2-2 min]	Traction Max Current [S2-60 min]	Pump Max Current [S3-15]
AC F2-C 24-120-200-001	24V	120Arms	42Arms	200A
AC F2-C 24-200-200-001	24V	200Arms	70Arms	200A
AC F2-C 48-150-200-001	36–48V	150Arms	53Arms	200A



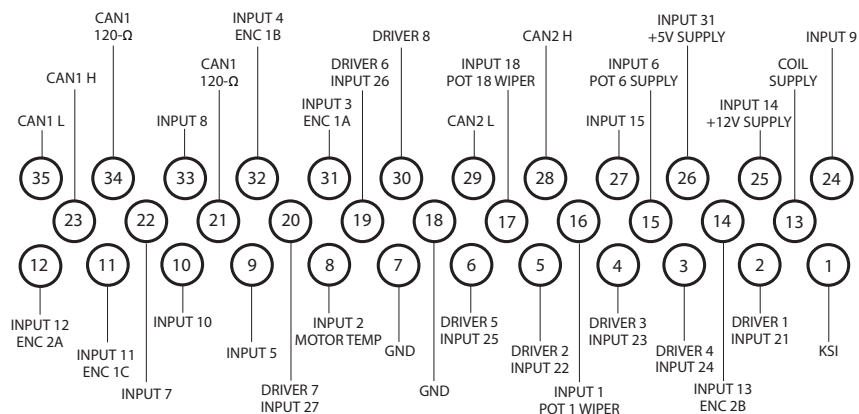
## DIMENSIONS



## CONNECTOR WIRING



## PINOUT CHART





## SPECIFICATIONS

Nominal Input Voltage	24V	36V/48V
Undervoltage	12V	18V
Overvoltage	30V	60V
PWM Frequency	10kHz	
Maximum Encoder Frequency	20kHz	
Maximum Controller Output Frequency	500Hz	
Electrical Isolation to Heatsink	500Vac	
Storage Ambient Temperature	-40°C to 95°C	
Operating Ambient Temperature	-40°C to 50°C	
Thermal Cutback	Controller linearly reduces maximum current limit with an internal heatsink temperature from 85°C (185°F) to 95°C (203°F); complete cutoff occurs above 95°C (203°F) and below -40°C (-40°F).	
Design Life	8000 hours	
Package Environmental Rating	IP65	
Weight	1.5Kg	
Dimensions W x L x H	200mm x 120mm x 57.5mm	
EMC	Designed to the requirements of EN 12895:2015	
Safety	Designed to the requirements of EN ISO 13849-1:2015	
UL	UL583 Pending	

**WARRANTY** Two year limited warranty from time of delivery.

The Curtis Difference  
You feel it when you drive it




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Specifications subject to change without notice

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