



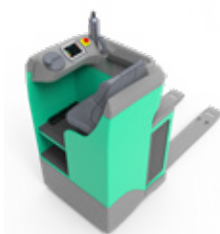
CURTIS

Motor Controllers



# ACF2-C

## AC Motor Controller and DC Pump System Controller





## 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. The AC F2-C motor controller, combined with a Half-bridge DC hydraulic pump and proportional valve control system, uses dual high performance ARM Cortex microprocessors in a compact package. The AC F2-C controller delivers 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 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 Curtis model 3141 CAN LCD display and the 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.
- ▶ 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 and IP67 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 or PMAC motor.
- ▶ Motor auto-characterization setup allows simple on-truck pairing with different motor types.
- ▶ Comprehensive library of AC 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.
- ▶ Hardware ‘ready’ for the forthcoming EN1175:2020.

### 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.

### 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 drivers
  - 2 quadrature encoder inputs
  - Sine/Cosine sensor inputs
  - +5V and +12V external power (200mA)

### Comprehensive CAN 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 CiA 301.
- ▶ 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.
- ▶ Thermal cutback, warning, and automatic shutdown provide protection to motor and controller.
- ▶ Error logging and fault history tables with CAN Emergency Messages.

### CAN-based Programming

- ▶ Model AC F2-C is programmable over the CANbus. This allows simple ‘vehicle level’ communication with many of the CAN-based service tools used by the major industrial truck manufacturers worldwide.
- ▶ Allows use of the Curtis Integrated Toolkit.





## SYSTEM ACCESSORIES



### Curtis Model 3141

A cost-effective, CAN-based LCD vehicle status display in a rugged 52mm diameter housing is the ideal partner to model AC F2-C.

- ▶ Large, easy-to-read 16-segment format LCD.
- ▶ Battery Discharge Indicator, Service (Hours) Counter and Diagnostic/ Message Center functions.
- ▶ Sealed to IP65 (IP67 optional).
- ▶ 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:

- ▶ **Launchpad**  
Starting point and project editor.
- ▶ **Programmer**  
Used to configure parameters, view monitor values, and view active faults and the fault history.
- ▶ **TACT**  
Improved version of the stand-alone oscilloscope/ datalogging tool.
- ▶ **VCL Studio**  
Editor and compiler for VCL software.
- ▶ **Menu Editor**  
Tool to create and modify programming menus.
- ▶ **Package & Flash**  
Downloader tool to load your software into the CAN device.

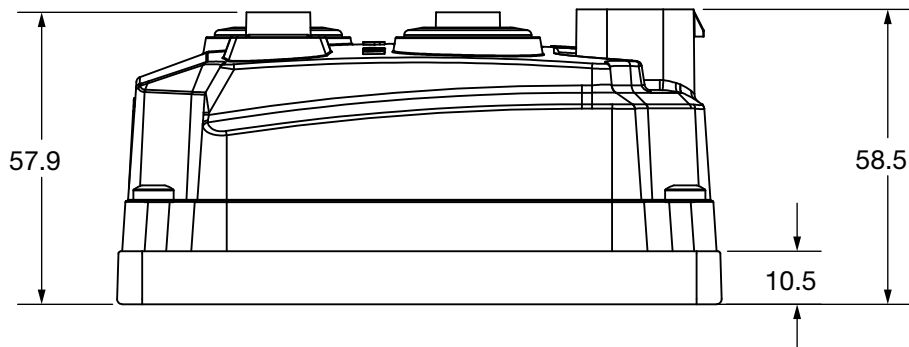
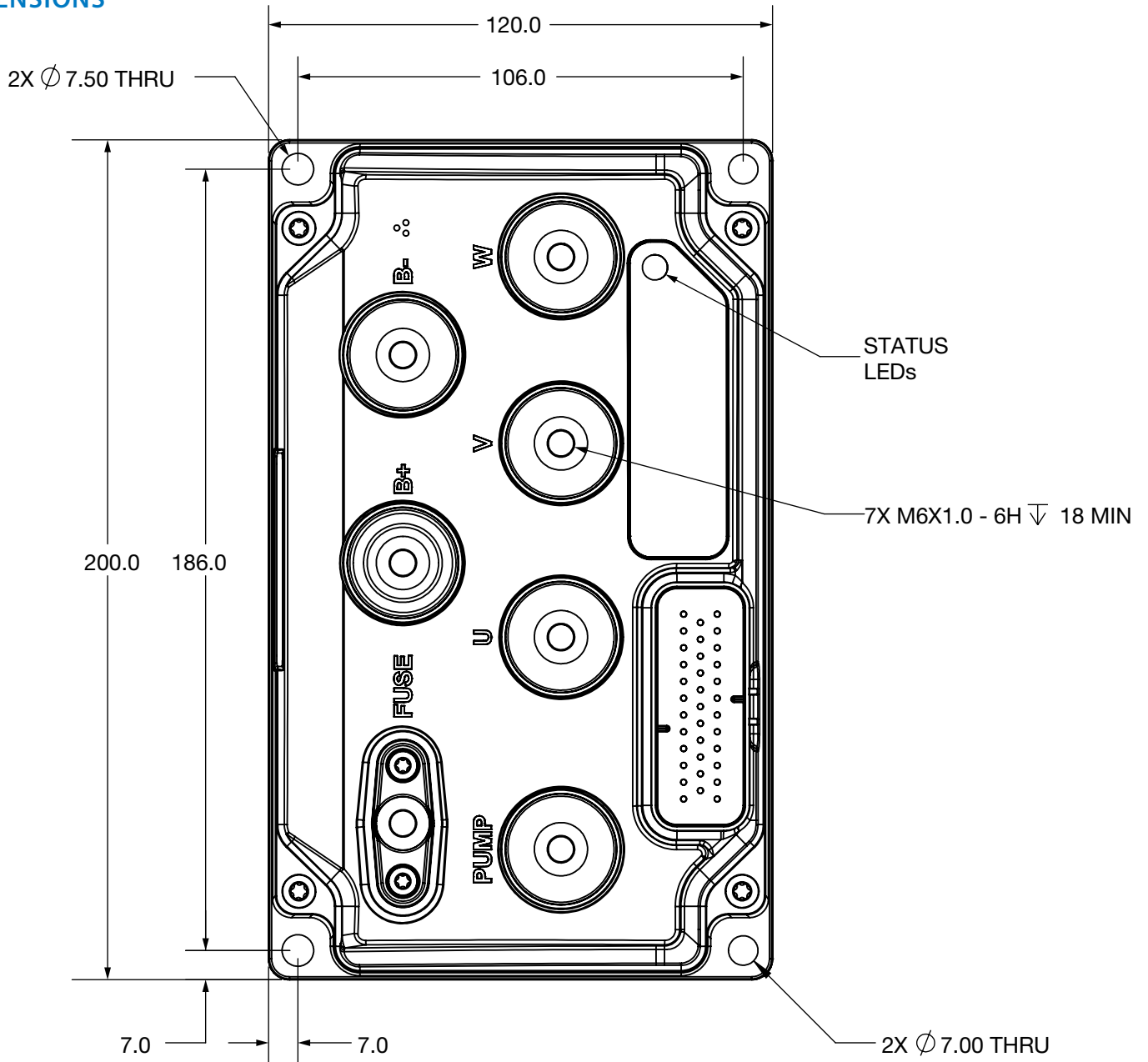
The Curtis Integrated Toolkit is compatible with many leading USB>CAN interface dongles from Peak, Kvaser, iFAC, Sontheim, etc. Contact your local Curtis Sales office for further information.

## MODEL CHART

Model Number	Nominal Battery Voltage	Traction Max Current [S2-2 min]	Traction Max Current [S2-60 min]	Pump Max Current
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 24-240-280-001	24V	240Arms	84Arms	280A
AC F2-C 24-280-300-001	24V	280Arms	98Arms	300A
AC F2-C 48-150-200-001	36–48V	150Arms	53Arms	200A
AC F2-C 48-240-240-001	36–48V	240Arms	84Arms	240A

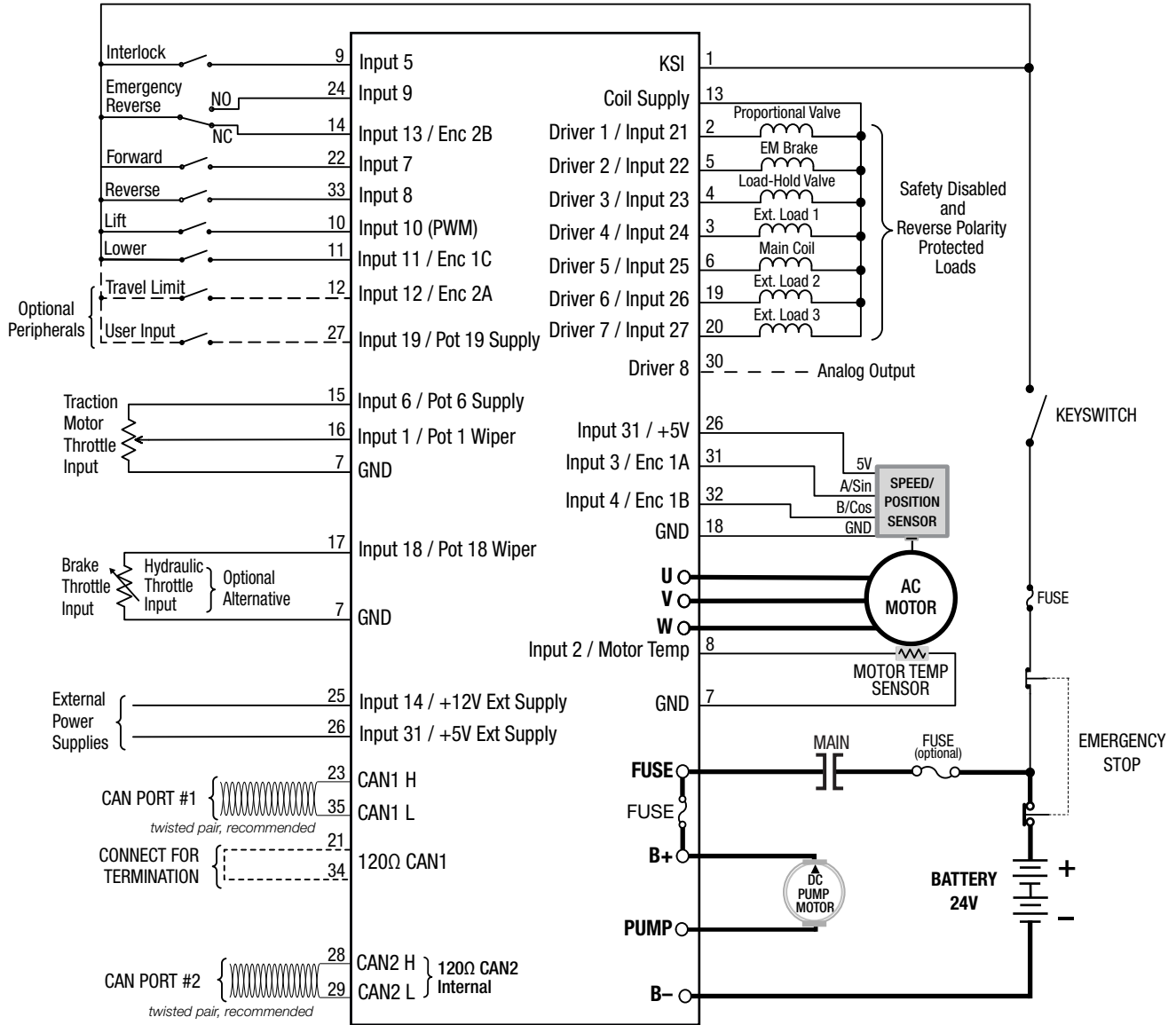


## DIMENSIONS

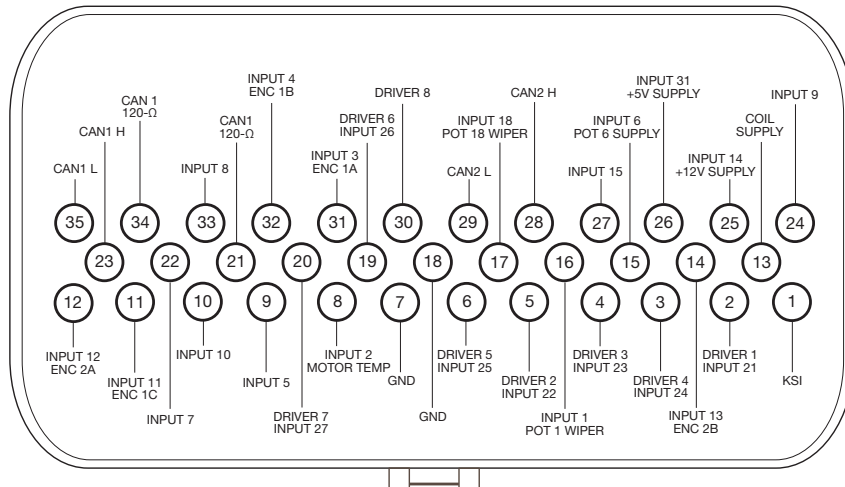




## CONNECTOR WIRING



## PINOUT CHART





## SPECIFICATIONS

Nominal Input Voltage	24V	36V/48V
Undervoltage	12V	18V
Overvoltage	30V	63V
PWM Frequency	10kHz	
Maximum Controller Output Frequency	599Hz	
Electrical Isolation to Heatsink	500Vac	
Storage Ambient Temperature	-40°C to 95°C	
Operating Ambient Temperature	-40°C to 50°C	
Traction 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/IP67	
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**