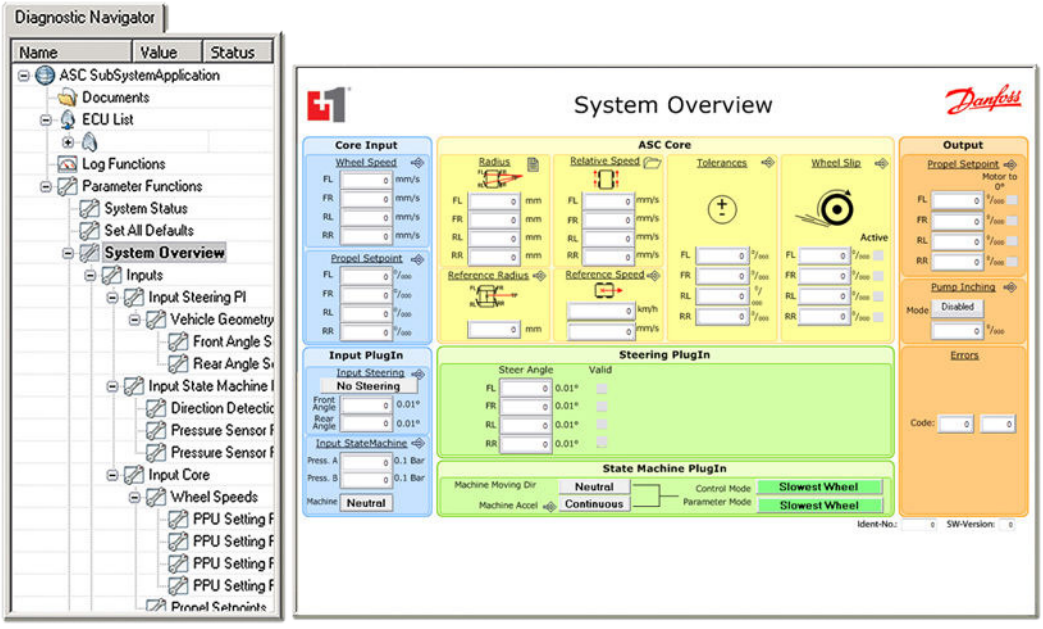
ENGINEERING
TOMORROW

System Description

Subsystem Application
Anti Spin Control



Revision history

Table of revisions

Date	Changed	Rev
May 2016	Replaced screen images for system overview and vehicle geometry; Updated to Engineering Tomorrow design	0301
August 2014	Danfoss layout	CA
August 2011	Updated wiring diagram	BA
August 2011	Updated screen captures, added anti spin valve	AB
July 2011	First edition	AA

Contents

Overview

About this document

This document provides general information about the ASC SSA Subsystem Application (SSA) software for use with Danfoss PLUS+1® microcontrollers and associated hydraulic and electronic products. In addition, it is a reference tool for vehicle OEM design, engineering, and service personnel.

SSA software puts 40 years of Danfoss mobile machinery propel system experience at your fingertips. It is a fully worked out application software example, enabling faster time-to-market and improved performance and functionality for both new machine designs and model variants. PLUS+1® GUIDE programmability allows developers to modify the SSA according to their individual vehicle requirements.

For control system developers programming in GUIDE, this document along with relevant software files, user manuals, and other documents is included in the Application File posted on the Danfoss web site for easy customer access and download.

This document is one of several sources of technical information for the control system. Additional sources of technical information for the control system are listed under *Referenced documentation* on page 7.

OEM responsibility

The OEM of a machine or vehicle in which Danfoss products are installed has the full responsibility for all consequences that might occur. Danfoss has no responsibility for any consequences, direct or indirect, caused by failures or malfunctions.

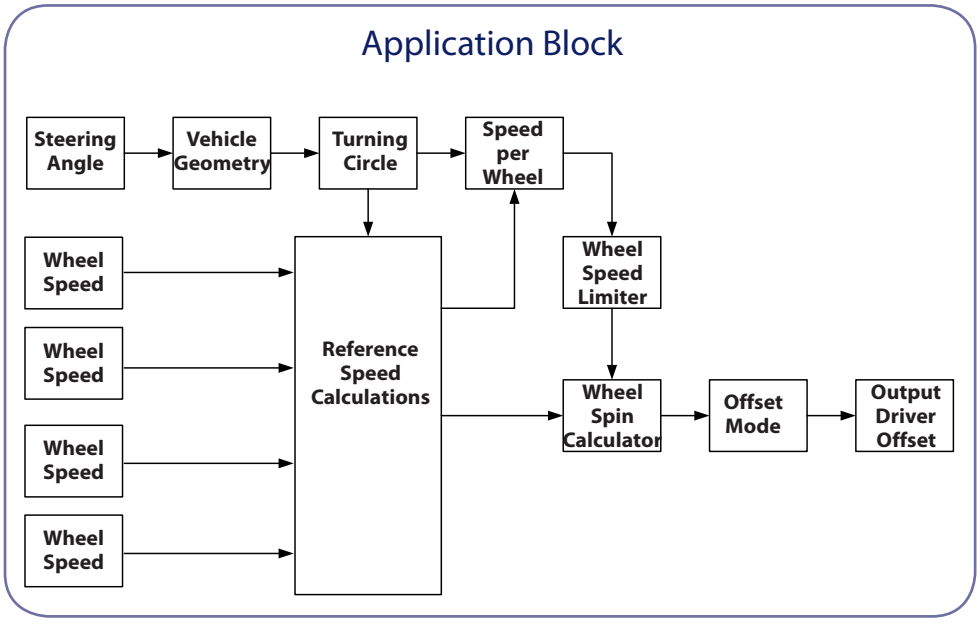
- Danfoss has no responsibility for any accidents caused by incorrectly mounted or maintained equipment.
- Danfoss does not assume any responsibility for Danfoss products being incorrectly applied or the system being programmed in a manner that jeopardizes safety.
- All safety critical systems shall include an emergency stop to switch off the main supply voltage for the outputs of the electronic control system. All safety critical components shall be installed in such a way that the main supply voltage can be switched off at any time. The emergency stop must be easily accessible to the operator.

Overview

Concept and function

The Anti Spin Control Subsystem Application (ASC SSA) is designed for use with hydraulically propelled vehicles incorporating single pump in conjunction with multiple motors. The subsystem application software includes: an Application Block, Plug-in features, and a sample application.

User-programmable Anti Spin Control Subsystem Application



Benefits

The ASC SSA is a fully integrated, dual path control system solution that's ready to be tailored to your vehicle requirements. The software is made up of validated component software blocks that greatly reduce vehicle testing time, provide responsive control and reduced project risk.

The graphical application code can be modified with GUIDE, using PLUS+1® Compliant products, such as sensors, pumps and motors.

These PLUS+1® Compliant products are represented by functional software blocks. These blocks can be dragged, dropped and connected to modify the ASC SSA to accommodate vehicle characteristics that are different from those of the example application.

Compliance blocks that are pre-programmed for CAN communication between joysticks and PLUS+1® controllers are particularly easy to modify within the application.

Advanced control features and flexibility of plug-in design provide state of the art system performance.

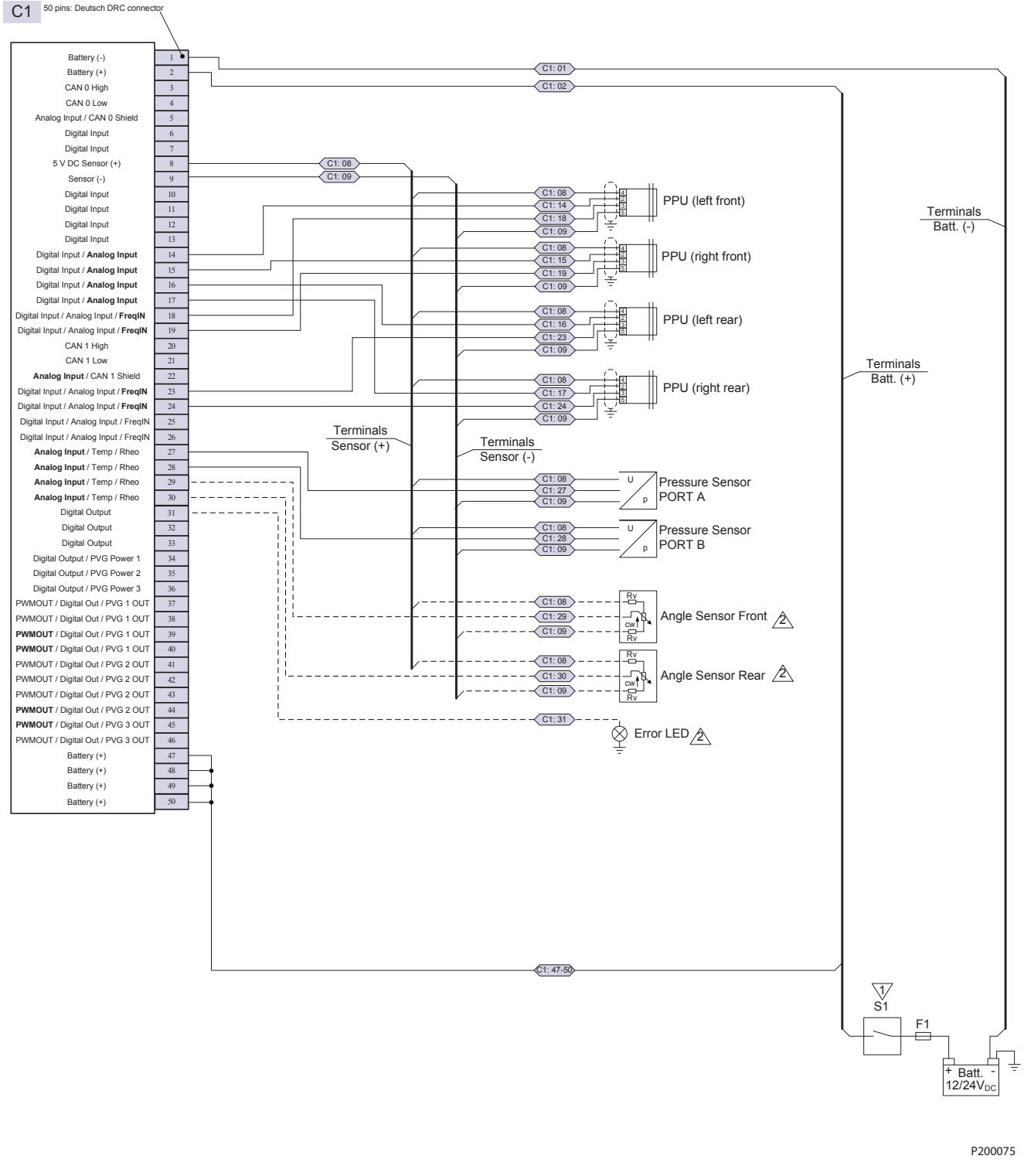
Pre-configured service screens are provided to set up the software and adjust parameters.

Overview

System application wiring

The ASC SSA example application has been designed to operate on the PLUS+1® MC050-012 microcontroller, but the ASC SSA can be modified to run on other PLUS+1® application hardware modules.

ASC SSA example application diagram



Referenced documentation

Comprehensive technical literature online at *powersolutions.danfoss.com*

PLUS+1® software development tools

PLUS+1® GUIDE Data Sheet	520L0708
PLUS+1® GUIDE User Manual	10100824
PLUS+1® Service Tool User Manual	520L0899
CG150 CAN/USB Gateway Interface Communicator Data Sheet	520L0945

Subsystem application

The application software files are listed under *Application file* on page 11.

Anti spin Control Subsystem Application System Description	L1106431
Anti spin Control Subsystem Application Data Sheet	L1106107
Recommended Machine Electronic Control System Start Up Procedures	11010667
Subsystem Application Service Tool User Manual	70055034
Subsystem Application I/O Mapping User Manual	70054663
Application Block User Manual	70047311
Steering Plug-in GUIDE Programming User Manual	70047346
Machine State Plug-in User Manual	70047347

Electronic product

PLUS+1® microcontrollers and displays

PLUS+1® Controller Family Technical Information	520L0719
DP2XX Graphical Display Family Technical Information	L1026202
DP200 Series Graphical Terminals Technical Information	11023625
DP250 Series PLUS+1 Mobile Machine Displays Data Sheet	L1026137
DP600 Series Graphical Terminals Technical Information	520L0699

Sensors

MBS2250 Heavy Duty Pressure Transmitter (SAE Thread Version) Data Sheet	11005452
MBS2250 Heavy-Duty Pressure Transmitter (DIN Thread Version) Data Sheet	520L0801
KPP Pulse Pickup (PPU) Technical Information	11029257

Hydraulic product

High power axial piston pumps with electronic displacement control

H1 Axial Piston Pump, Size 078, Single Technical Information	11062169
H1 Axial Piston Pump, Size 089/100, Single Technical Information	11069970
H1 Axial Piston Pump, Size 115/130, Single Technical Information	11063346
H1 Axial Piston Pump, Size 147/165, Single Technical Information	11063347

Referenced documentation

High power axial piston pumps with electronic displacement control (continued)

H1 Axial Piston Pump, Size 115/130, 147/165, ISL Integrated Speed Limitation Technical Information	11053026
Series 90 Axial Piston Pumps Technical Information	520L0603

High power variable displacement motors

H1B Bent Axis Variable Displacement Motors, Size 060/080/110 Technical Information	11037153
Series 51, Series 51-1 Bent Axis Variable Displacement Motors Technical Information	520L0440
Series 90 Axial Piston Motors Technical Information	520L0604

Medium power variable axial piston pumps with electronic displacement control

H1 Axial Piston Pump, Size 045/053 Tandem Technical Information	11063345
H1 Axial Piston Pump, Size 045/053 Single Technical Information	11063344
H1 Axial Piston Pumps, Single and Tandem Basic Information	11062168

Medium power variable displacement motors

L and K Frame Variable Motors Technical Information	520L0627
Series 40 Axial Piston Motors Technical Information	520L0636

Control system

System development tools

PLUS+1® GUIDE (Graphical User Integrated Development Environment) is a desktop software development tool used to create and customize application software to specific vehicle requirements. GUIDE's graphical editor allows easy development or modification of example applications by system engineers without formal software development training.

Components and application blocks can be dragged from the component selector and dropped onto the programming workspace for time-saving system design in the PLUS+1® GUIDE environment, generating downloadable applications for all programmable PLUS+1® controllers and displays.

PLUS+1® Service Tool uses the CG150 Interface Communicator for programming PLUS+1® controllers via CAN bus from a computer. Additionally, the PLUS+1® Service Tool features data logging capabilities with oscilloscope and bar graph displays used for diagnostics and tuning. Graphical design features allow development of specialized service screens to support applications created in PLUS+1® GUIDE.

The CG150 CAN/USB Gateway Interface Communicator serves as the interface between PLUS+1® modules on the vehicle CAN network and a laptop USB port.

Application hardware

The SSA software may only be loaded onto keyed PLUS+1® application hardware. If the application hardware key matches the Danfoss application software key the service tool permits the download to the target application hardware.

Danfoss application key number is: 10106603

See product data sheet for controllers assembly part numbers.

Software details

GUIDE-programmable

PLUS+1® GUIDE programmable application software blocks. Graphical application code contained in the PLUS+1® GUIDE programmable pages of the SSA can be modified by the user to tailor the application to the specific needs of the vehicle or PLUS+1® controllers that are different from the example provided by Danfoss.

Application block

The software application block assesses the wheel speed with consideration to vehicle geometry and steer angle, wheel slip is identified and a corresponding output command signal is generated for integration with the propel hardware and /or software configuration. The application block supports manual enabling/disabling, operating tolerances for minimum motor speed, maximum motor speed and steer angle.

Plug-ins

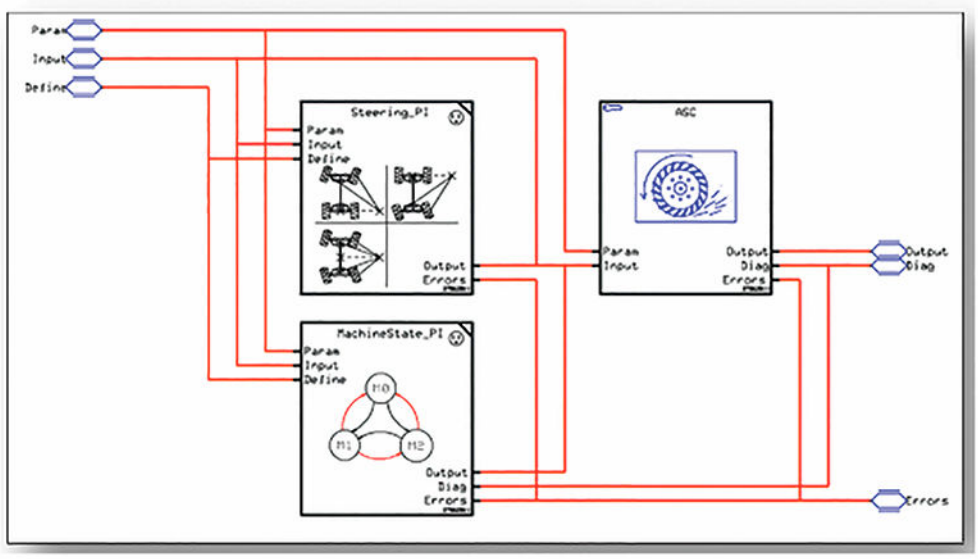
The Application Block accepts optional plug-in modules. Plug-ins provide design flexibility by allowing enhanced features or performance. They may be used or deleted to conserve code space. Basic dual path control functionality is preserved by replacing plug-ins with jumpers.

- Plug-in **Steering_PI Page**

Control system

  - **Steering** plug-in converts vehicle geometry to values understood by the application block. Two and four wheel Ackerman steering geometry support is included, custom solutions may be created and utilize socket.
- Plug-in **MachineState_PI Page**
  - **Machine State** plug-in assesses command relative to propel conditions to establish an appropriate anti-spin operation. The plug-in utilizes pressure signals to determine slip wheel relative to vehicle acceleration or deceleration.

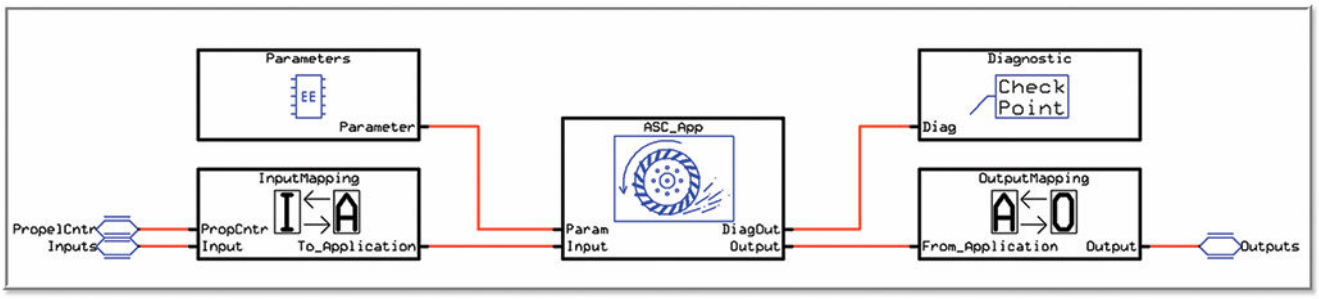
I/O mapping



F200016

- **Input_Mapping** page connects hardware input signals to appropriate software signals used within the ASC application block and plug-ins.
- **Output_Mapping** page connects the output command to physical hardware.
- **Parameters** page applies configuration values for the anti spin operation.
- **Diagnostic** page provides checkpoint visibility for the subsystem application.

Input mapping, output mapping, parameters, diagnostic



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Downloading SSA software

PLUS+1® GUIDE license holders may visit the Danfoss web site, download the application file, and install the enclosed software and documentation on their hard drive.

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Control system

- The application file contents are downloaded to your computer by clicking on the `SSA exe.zip` link, clicking through the user acceptance agreement and installing the contents in the folder you specify on your hard drive.

Application file

Application file for SSA software products contains all SSA graphical source code files, all required service screens software files, and all software product documentation and user manuals associated with the SSA. The software product documentation and user manuals (PDF) files are listed under *Referenced documentation* on page 7: *Subsystem application*.

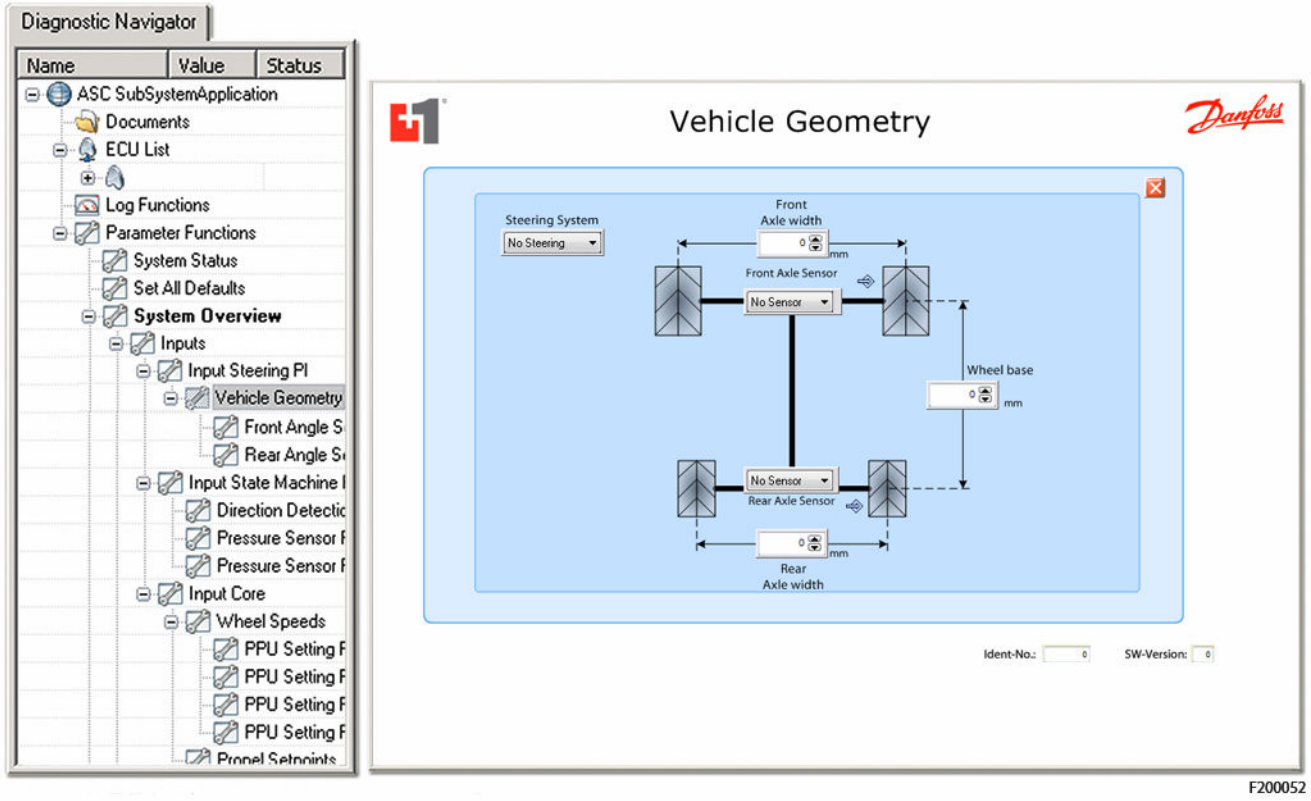
The Application file for the ASC SSA includes the following software files:

Software Installer Executable	.EXE	11081276_Vx
Subsystem Application Software	.P1P	11081276
Application Block Software	.SCS	11096901
Steering Plug-in Software	.SCS	11096922
Machine State Plug-in Software	.SCS	11096923
Release Notes	.HTML	— —

Vehicle Geometry screen

Service Tool configurability. The Vehicle Geometry screen is used to configure the physical dimensions and steering mechanism.

Vehicle Geometry screen and Diagnostic Navigator

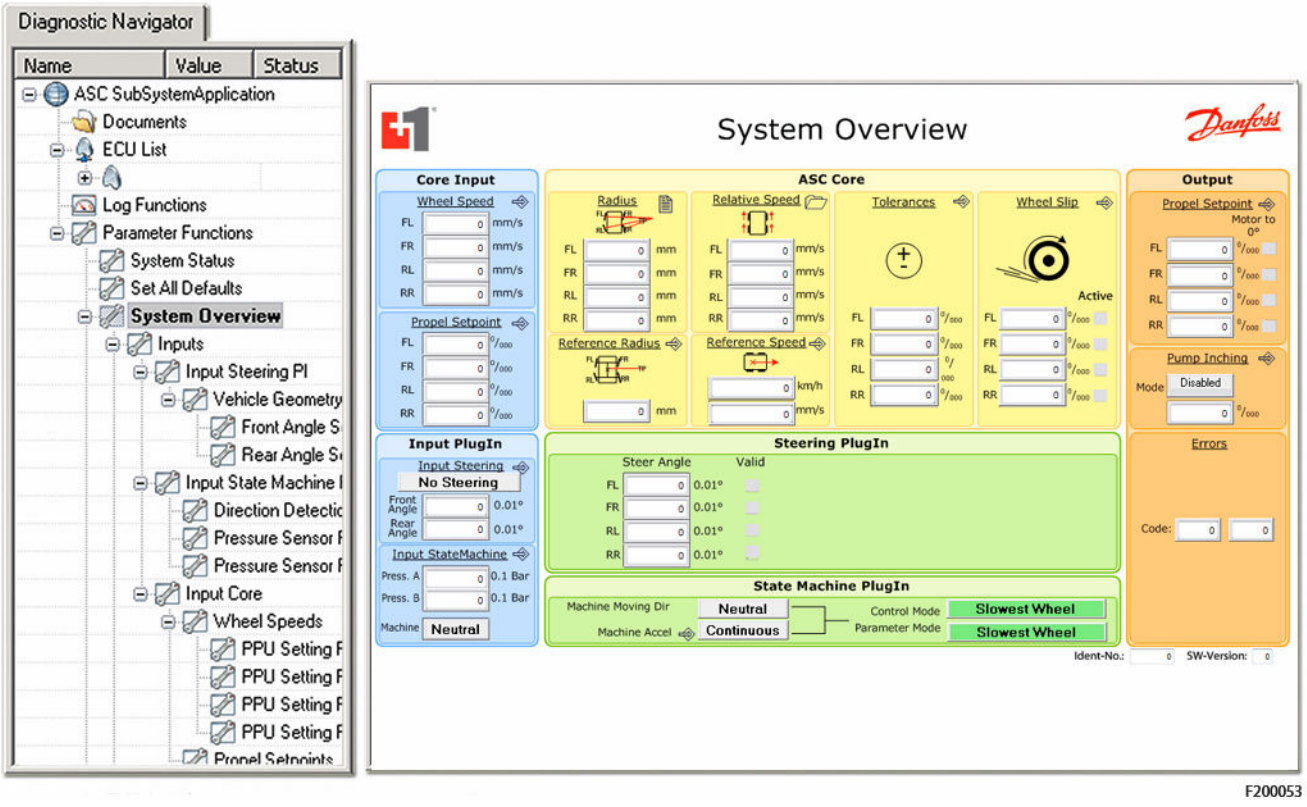


Control system

System Overview screen

Service Tool configurability. The System Overview screen consolidates the most important about the system, links provide access to additional detail.

System Overview screen and Diagnostic Navigator



Related products

Electronic product details

PLUS+1® microcontrollers

- High speed DSP technology to process even the most complex applications
- CAN-based communications for state-of-the art control performance
- 256K internal flash memory is recommended

PLUS+1® expansion modules

- Expand control system capabilities with CAN-based Input/Output modules
- 12 and 24 pin housings with five possible configurations
- Stackable design for optimum mounting flflexibility

DP200 and DP250 displays

- Cost effective alternative to existing analogue gauges
- DP200 high-resolution monochrome displays fit every budget without compromising performance
- DP250 high resolution color TFT (240x320 pixels, 15-bit color) displays are viewable in a wide range of lighting conditions
- Options featuring front USB 2.0 port for easy connection to PC-based service and diagnostic tools, extended I/O for improved input design flexibility, real-time clock, and display heater
- Customize the look and feel of engine monitoring and performance messages with Engine Information Center (EIC) application software
  - Read and display engine operation and performance messages which are transmitted by the engine control module over a J1939 CANbus
  - Supports fifty engine and machine performance variables on up to four screens with up to four variables per screen
  - Soft keys at the front of the display provide the operator with easy navigation through diagnostic and engine information

Related products

DP600 display

- Transflective TFT and DSTN, LCD display technologies, high resolution display, antiglare screen, and sensor controlled backlighting
- CAN, RS-232 and USB interfaces
- Additional inputs for an external navigation button, which enables you to maneuver through all terminal functions

MBS pressure sensors

- Available in seven sizes ranging from to 2.5 bar to 600 bar [362 psi to 8,702 psi], load pressure is 10 to 20 times the measuring range
- Temperature compensated, linearized, and laser calibrated
- Available with DIN or UNF thread

KPP pulse pickup speed sensors

- Outputs a digital pulse signal in response to the speed of a permanently magnetized speed ring on the motor's cylinder block or shaft
- Ideal for low-speed measurement
- For rugged outdoor, mobile, speed-sensing applications that do not allow contact with the rotating shaft

Related products

Hydraulic product details

H1 axial piston variable pumps


F301389

- Optimized for electrohydraulic control
- Designed for improved operating efficiencies
- Designed for short length and compact installation

Series 90 high power axial variable piston pumps


F301346

- 7 different displacements
- Pressures up to 480 bar [6962 psi]

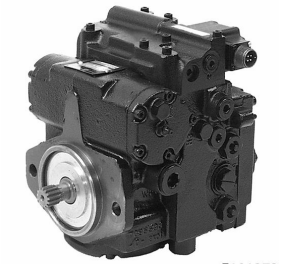
H1 medium power integral tandem axial piston pumps


F301384

- 2 integral tandem displacements
- Optimized for electrohydraulic control

Related products

S42 medium power variable pumps


F101373

- Pressures up to 415 bar [6019 psi]
- Integral loop flushing

H1B bent axis variable displacement motors


F301602

- Zero degree motor angle capability
- Electric 2-position or electric proportional control
- Higher corner HP/package size ratio

Series 51 bent axis variable displacement motors


F301559

- Large displacement ratio (5:1)
- Compact and lightweight
- Pressures up to 480 bar [6962 psi]

Series 90 high power axial piston motors


F301343

- Two-position motor
- Short installed length

Related products

L and K frame medium power motors


F301351

- Cartridge and SAE mounts available
- Variable motor with 3.4:1 working displacement ratio
- 5 displacements in one compact package

Series 40 medium power motors


F101923

- Short installed length
- Pressures up to 345 bar [5000 psi]

Low speed high torque motors


F301220

- High efficiency
- Long life under extreme operating conditions
- Smooth running over entire speed range

Anti spin control valve


F200019

- Easy to service
- Flexibility

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Products we offer:

- Bent Axis Motors
- Closed Circuit Axial Piston Pumps and Motors
- Displays
- Electrohydraulic Power Steering
- Electrohydraulics
- Hydraulic Power Steering
- Integrated Systems
- Joysticks and Control Handles
- Microcontrollers and Software
- Open Circuit Axial Piston Pumps
- Orbital Motors
- PLUS+1® GUIDE
- Proportional Valves
- Sensors
- Steering
- Transit Mixer Drives

Danfoss Power Solutions is a global manufacturer and supplier of high-quality hydraulic and electronic components. We specialize in providing state-of-the-art technology and solutions that excel in the harsh operating conditions of the mobile off-highway market. Building on our extensive applications expertise, we work closely with our customers to ensure exceptional performance for a broad range of off-highway vehicles.

We help OEMs around the world speed up system development, reduce costs and bring vehicles to market faster.

Danfoss – Your Strongest Partner in Mobile Hydraulics.

Go to www.powersolutions.danfoss.com for further product information.

Wherever off-highway vehicles are at work, so is Danfoss. We offer expert worldwide support for our customers, ensuring the best possible solutions for outstanding performance. And with an extensive network of Global Service Partners, we also provide comprehensive global service for all of our components.

Please contact the Danfoss Power Solution representative nearest you.

Comatrol
www.comatrol.com

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www.schwarzmueller-inverter.com

Turolla
www.turollaocg.com

Hydro-Gear
www.hydro-gear.com

Daikin-Sauer-Danfoss
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