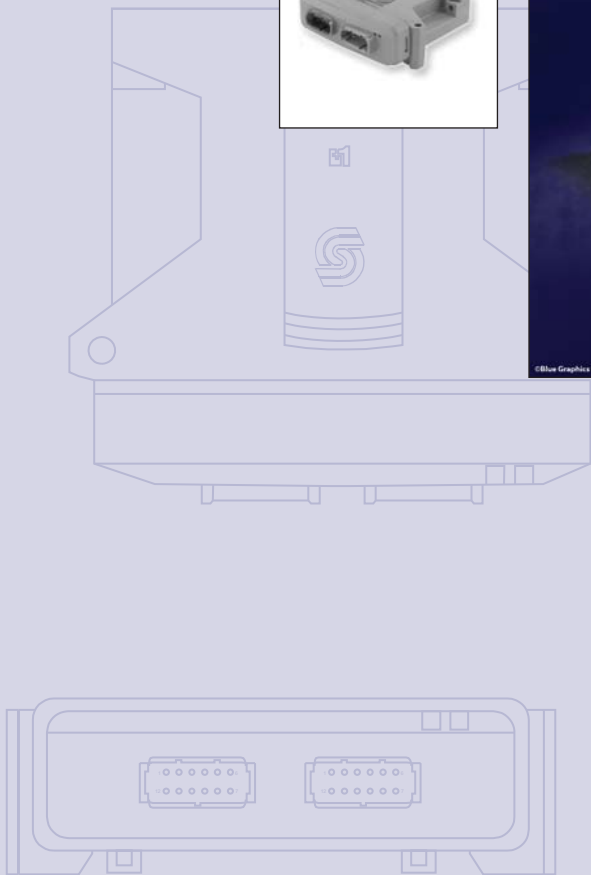




Generic Dual Path Subsystem Application

System Description



Revision History

Table of Revisions

Date	Page	Changed	Rev
23—24 Mar, and 7 Apr, 2010	Various	Title, part numbers corrected, typos, various minor changes	AB-G
Mar 2010		Initial release	AA

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Generic Dual Path Subsystem Application
System Description
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Generic Dual Path Control Subsystem Application System Description Overview

About this Document

This document provides general information about the Generic Dual Path (GDP) Subsystem Application (SSA) software for use with Sauer-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 Sauer-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 Sauer-Danfoss website 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, pages 8 and 9.

OEM Responsibility

The manufacturer of a machine or vehicle using PLUS+1 electronic controls is responsible for correctly applying and configuring PLUS+1 products. Sauer-Danfoss recommends that the OEM perform a system-level Failure Mode Effects Analysis (FMEA).

You can find additional information about OEM responsibilities in the *PLUS+1 Controller Family Technical Information, 520L0719* and *Recommended System Start-up Procedures Technical Information, 11010667*.

Overview

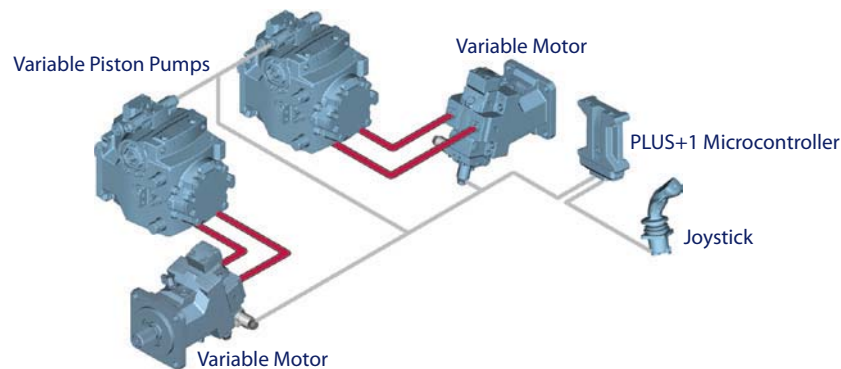
Concept and Function

The GDP SSA is designed to control hydrostatically propelled vehicles incorporating independent left and right side pump/motor propel systems. Steering is achieved by differential command signals, reducing the inside propel speed command while maintaining or increasing the outside propel speed command.

The default drive and steering human machine interface (HMI) for the GDP application is a single XY joystick. Input for a hydrostatic braking/inching pedal is also provided. HMI and CAN signals, switch inputs, and sensor signals required for optimized tracking, track stall, anti-stall, and temperature derate are routed to a PLUS+1 application hardware microcontroller.

The GDP application software conditions the HMI and sensor signals, mathematically combines them using control logic developed and tested by Sauer-Danfoss, and provides command signals that the PLUS+1 microcontroller outputs to the electronically controlled variable piston pumps.

Flow from the pumps is directed to the hydraulic motors, whose displacement can be shifted to provide a wider range of optimized vehicle performance.



Benefits

The GDP 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.

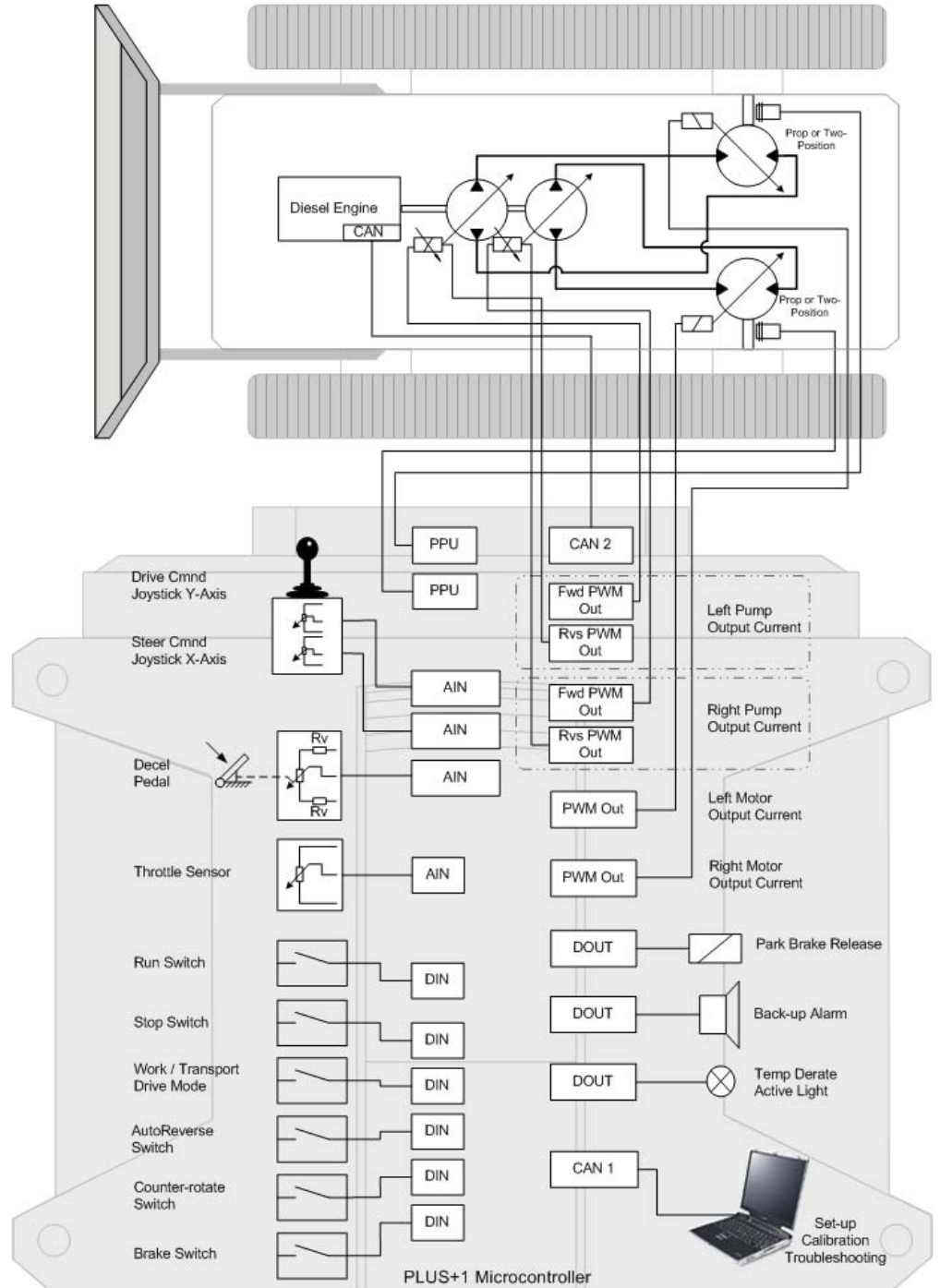
Using GUIDE, a developer can modify the graphical application code, using PLUS+1 compliant products, such as sensors, pumps and motors, that are represented by functional software blocks. These blocks can be dragged, dropped and connected to modify the GDP SSA to accommodate vehicle characteristics that are different from those of the example application.

Compliance blocks that are pre-programmed for CAN communication between joysticks and PLUS+1 microcontrollers 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.

System Configuration



P108 234

Enter provided Sauer-Danfoss documents order numbers in search feature online at:
www.sauer-danfoss.com

**PLUS+1 Software
Development Tools**

PLUS+1 GUIDE Data Sheet	520L0708
PLUS+1 GUIDE User Manual	10100824
PLUS+1 GUIDE 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*, page 14.

Generic Dual Path Subsystem Application System Description	11058298
GDP Subsystem Application Software Data Sheet	11058300
Recommended Machine Electronic Control System Start Up Procedures	11010667
GDP Subsystem Application User Manual	11061724
GDP Subsystem Application Service Tool User Manual	11058326
GDP Application Block User Manual	11047130
Antistall Plug-in GUIDE Programming User Manual	11057258
How to Tune the Antistall and Tracker Plug-ins User Manual	11060612
Trackstall Plug-in GUIDE Programming User Manual	11057259
Tracker Plug-in GUIDE Programming User Manual	11057260
Temperature Derate Plug-in GUIDE Programming User Manual	11057257

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

Operator Input Devices

JS6000 Joystick Base Technical Information	520L0760
JS1000 Joystick Base Technical Information	520L0826
Electronic Foot Pedal Technical Information	11044978

Sensors

MBS2250 Heavy Duty Pressure Transmitter (SAE Thread Version)	11005452
MBS2250 Heavy-Duty Pressure Transmitter (DIN Thread Version)	520L0801
Standard/Extended Range Liquid and Air Temperature Sensors Data Sheet	11076525
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
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 EDC

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

System Development Tools



PC with Sauer-Danfoss PLUS+1 GUIDE.
Gateway supported by Service Tool program.
PLUS+1 compliant module.

F101908

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 microcontrollers and displays.

PLUS+1 Service Tool uses the CG150 Interface Communicator for programming PLUS+1 microcontrollers via CAN bus from a computer. Additionally, the 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 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 GDP SSA software may only be loaded onto keyed PLUS+1 application hardware. If the application hardware key matches the Sauer-Danfoss application software key the service tool permits the download to the target application hardware.

Sauer-Danfoss application key number is: 10106603

PLUS+1 Application Hardware

PLUS+1 Microcontroller	Application hardware description	Part number
MC024-014	24 pin controller	11054442
MC024-024	24 pin controller	11026049
MC050-012	50 pin controller	11013734
MC050-022	50 pin controller	11013735
MC088-01B	88 pin controller	11071592

**Software
Details****GUIDE-programmable Application Software Blocks**

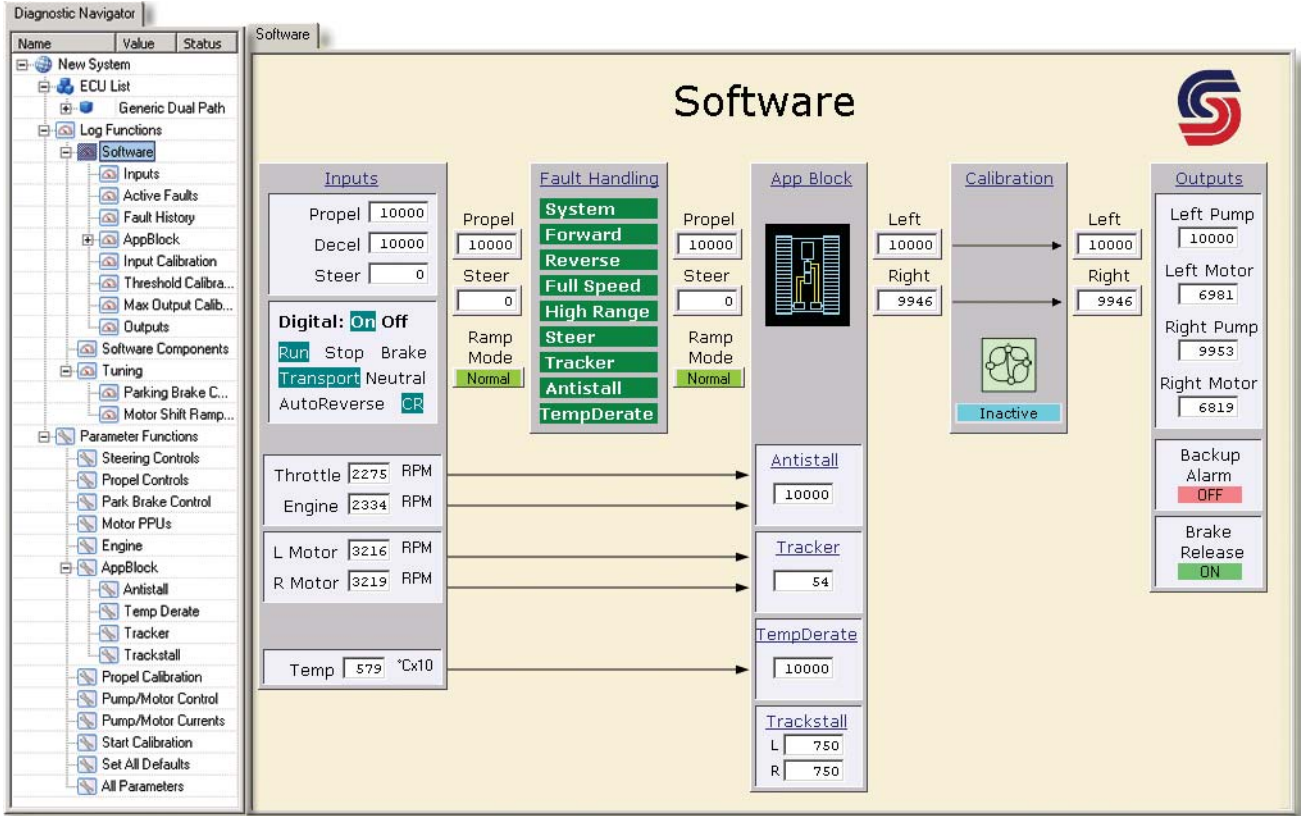
Graphical application code contained in the GUIDE-programmable pages of the GDP SSA can be modified by the user to tailor the application to the specific needs of the vehicle or PLUS+1 microcontrollers that are different from the example provided by Sauer-Danfoss. The following pages are accessible to developers:

- The InMap Block connects hardware input signals to the appropriate software application signals; programmability allows adaptation of the software to PLUS+1 microcontrollers with different pin-out configurations.
- The Input Cond Block converts incoming raw signals from InMap into meaningful command values; programmability allows use of sensors and input devices other than the ones used in the example software. Access to GDP graphical source code is provided for the following operator input devices so they can be modified if required:
 - Propel joystick inputs for steering and speed
 - Safety lockouts
 - Counter-rotate switch
 - Throttle position
 - Calibrate switch
 - Decelerator/inch pedal
 - Brake input (can be combined with decelerator/inch pedal)
 - Max speed/creep lever/switch
 - Mode switch (transport, work, auto reverse)
 - Transmission of engine speed command over CAN
- The Fault Block receives signal reports and manages corresponding actions, such as function disabling, fault recording and LED blink code errors; programmability allows tailoring of fault modes to specific vehicle design and shut down behavior characteristics.
- The Calibration Block manages scaling of sensor inputs and outputs; programmability allows use of alternative calibration strategies.
- The Output Drivers Block converts percentage command signals into the corresponding pump and motor output currents; programmability allows connection to a range of electrohydraulic pump and motor actuators. Access to GDP graphical source code is provided for the following operator output devices so they can be modified if required:
 - Pump displacement command
 - Motor displacement command
 - Back-up alarm command
 - Brake solenoid command (optional)
- The OutMap Block routes current output commands to the associated output pins; like input mapping, programmability here allows adaptation of the software to microcontrollers with different pin-out configurations.

Software Details (continued)

GUIDE-programmable Application Software Blocks (continued)

Software Log Function Screen



F101909

The Software log function screen shows a high-level signal flow from the inputs to the outputs as well as the signal status. Additional screens for configuring, tuning, calibration, and setting parameters are provided.

Software Details (continued)

Application Block

The software core functionality converts steering and propel speed input commands into pump and motor output commands. The following advanced software features are managed in the Application Block:

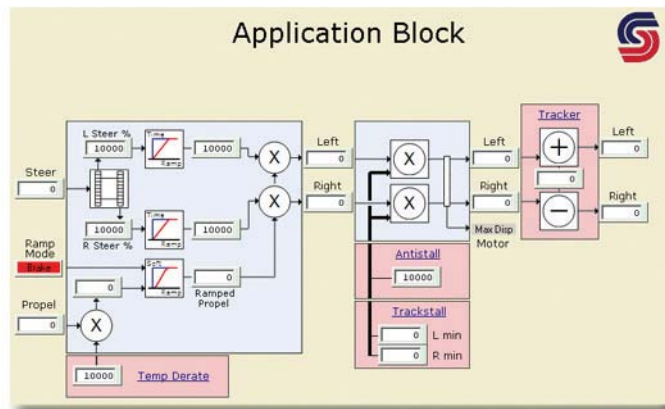
- Steering is infinitely variable from straight tracking, to pivot steer, to full counter-rotate, in either direction.
- Steering can be set up as differential (paver) or non-differential (crawler) in a turn, where inside track speed is increased without speeding up the outside track.

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.

- The Tracker Plug-in uses closed loop control to correct errors caused by uneven loading, hydraulic volumetric efficiencies, and calibration disparity, eliminating the need for operators to make small continuous steering corrections so operator can concentrate on bucket or blade operations.
- The Antistall Plug-in monitors engine rpm, and reduces the propel command for engine recovery, eliminating need for operator to make propel speed adjustments under varying machine loads.
- The Trackstall Plug-in works in conjunction with antistall limiting the propel output reduction to maintain motor torque. This keeps the tracks loaded when the machine is undergoing heavy loading that could cause hydraulic relief valves to open, or propel command to be too small to maintain motor torque, improving ground engagement.
- The Temperature Derate Plug-in reduces propel command relative to high temperatures to avoid damage to hydraulic components.

Application Block Service Screen



F101907

The Application Block service screen shows signal flow from the inputs to the outputs of the application block. Additional service screens for each plug-in are also provided.

**Software
Details (continued)**

Coordinated Brake Control

- Coordinated application of propel command with brakes, allowing:
 - Reduced possibility of propel driving through brakes when stopping or starting.
 - Full use of hydrostatic braking when stopping to minimize brake wear.
 - Electric brake actuation output control to provide hill hold function with track speed inputs.

Pump and Motor Displacement Phasing

- Two displacement and variable displacement motors are supported by automatically coordinating displacement commands to each pair of hydraulic pumps with hydraulic motors, providing:
 - Full speed range capability.
 - Maximum torque to the ground via tracks with minimum hydraulic pressure for given speed command.
 - Automatic hydraulic motor down shifting when engine loading exceeds desired levels with antistall function.

Downloading SSA Software

PLUS+1 GUIDE license holders may visit the Sauer-Danfoss website, download the Application File, and install the enclosed software and documentation on their hard drive.

- The Application File is located online for customer downloading at this location:
<http://www.sauer-danfoss.com/Products/MobileElectronics/PLUS1GUIDE/PLUS1GUIDEDownloads/ApplicationSoftware>.
- The Application File contents are downloaded to your computer by clicking on the SSA .exe link, clicking through the user acceptance agreement and installing the contents in the folder you specify on your hard drive.

Application File

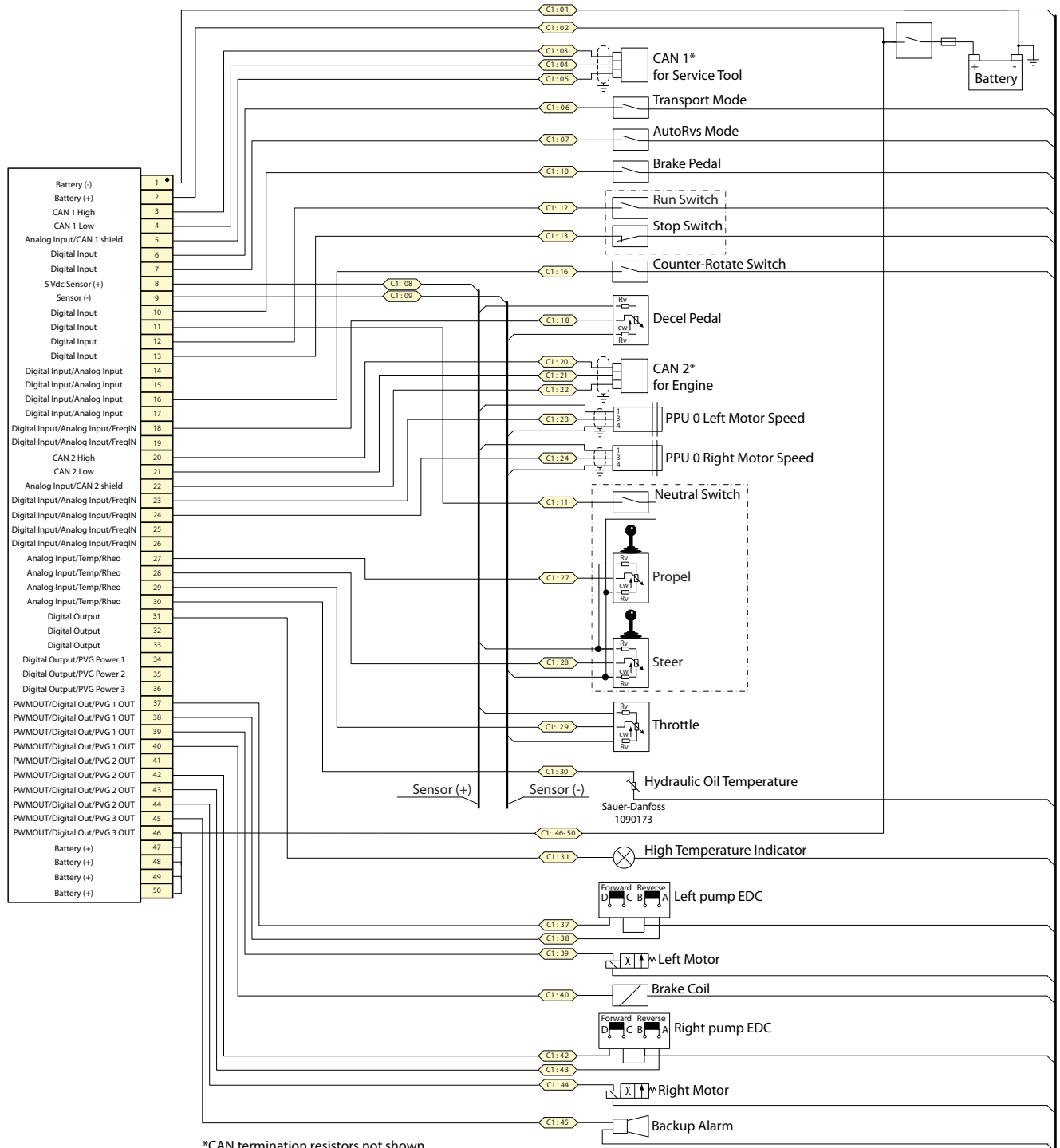
Application File for SSA software products contains all SSA graphical source code files, all required service screens software files, and all software product documentation and user manuals associated with the SSA. The software product documentation and user manuals (PDF) files are listed under *Referenced Documentation: Subsystem Application*, page 8.

The Application File for the GDP SSA includes the following software files:

Software Installer Executable (.EXE file)	11079203
Subsystem Application Software (.P1P file)	70037315Vxxx
Application Block Software (.SCS file)	70024851Vxxx
AntiStall Plug-in Software (.SCS file)	70024853Vxxx
Trackstall Plug-in Software (.SCS file)	70024855Vxxx
Tracker Plug-in Software Block (.SCS file)	70024852Vxxx
Temperature Derate Plug-in Software (.SCS file)	70024853Vxxx
Release Notes (.HTML file)	— —

Sample Application Wiring Diagram

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



*CAN termination resistors not shown.

Programmability Options

Key: ○ Service Tool Configurable ● GUIDE-Programmable

Wiring Diagram Inputs

Type	Feature	Description	Service Tool Configurable	Guide-Programmable
Functional features	Transport Mode Switch	Determines whether or not high range (with limited max speed) can be enabled. If the switch is not connected, high range is disabled. This should not be active at the same time as AutoRvs Mode Switch.	—	●
	AutoRvs Mode Switch	Determines whether or not AutoRvs Mode is enabled (which is work mode in forward direction and transport mode in reverse). If the switch is not connected then AutoRvs Mode is not available. This should not be active at the same time as the transport mode switch.	—	●
	Brake Pedal Switch	1) Interlock to momentarily disable propel when brake active. 2) Apply brake and brake release delay (input to).	—	●
	Neutral Switch	Used to cross-check joystick against neutral switch. If the switch and joystick disagree, a fault will occur.	—	●
	Run Switch	1) Used in interlock to enable calibration. 2) Used in interlock to enable propel. If the switch is not connected, propel will be disabled and the brake will not release.	—	●
	Stop Switch	1) Used in interlock to enable calibration. 2) Used in interlock to enable propel. This switch should also have the opposite value as the run switch. If not connected the user can not enable calibration mode.	—	●
	Counter-Rotate Switch	Used to enable counter-rotate. If the switch is not connected then counter-rotate will be disabled.	—	●
	Decel Pedal	This pedal is used to proportionally reduce the throttle and propel commands. The decel pedal utilizes the Sensor_2Pt_AC function block.	—	●
	CAN 2 (High) Engine	This port is used for communication with the engine.	—	●
	CAN 2 (Low) Engine	This port is used for communication with the engine.	—	●
	CAN 2 (Shield) Engine	This port is used for communication with the engine.	—	●
	PPU Left Motor Speed	1) Used during Propel calibration. 2) Tracker plug-in. 3) Hill-Hold. If not connected cannot calibrate propel, or use the tracker or hill-hold functions. The software uses KPP PPU speed sensor PLUS+1 compliance block (5V regulated power supply to sensor, with wire fault detection capability).	—	●
	PPU Right Motor Speed	1) Used during propel calibration. 2) Tracker plug-in. 3) Hill-Hold. If not connected cannot calibrate propel, or use the tracker or hill-hold functions. The software uses KPP PPU speed sensor PLUS+1 compliance block.	—	●
	Propel Command		—	●
	Steer Command		—	●
Throttle Command	This provides engine throttle command.	—	●	
Hydraulic Oil Temperature	For use in temperature derate plug-in. If a temperature sensor is not connected temperature derate will not be available. The software uses the Sauer-Danfoss liquid temperature sensor compliance block.	—	●	

**Programmability
 Options (continued)**

Key: ● Service Tool Configurable ● GUIDE-Programmable

Wiring Diagram Outputs

Type	Feature	Description	Service Tool Configurable	Guide-Programmable
Functional features	High Temperature Indicator	Action for temperature derate is to reduce propel at high fluid temperature. Dash light will turn on to indicate vehicle is going slower because of temperature derate	—	●
	Left Pump EDC - FWD	Output for left pump in the forward direction. The S90 EDC PLUS+1 pump compliance block is used.	—	●
	Left Pump EDC - REV	Output for left pump in the reverse direction. The S90 EDC PLUS+1 pump compliance block is used.	—	●
	Left Motor Proportional Output	Proportional output for motor displacement control. The S51_24V_L PLUS+1 motor compliance block is used in GDP subsystem for the motor.	—	●
	Brake Coil	Output to release the brake. When the coil is energized by controller supply voltage, the brake is released.	—	●
	Right Pump EDC - FWD	Output for right pump in the forward direction. The S90 EDC pump PLUS+1 compliance block is used.	—	●
	Right Pump EDC - REV	Output for right pump in the reverse direction. The S90 EDC pump PLUS+1 compliance block is used.	—	●
	Right Motor Proportional Output	Proportional output for motor displacement control. The S51_24V_L motor PLUS+1 compliance block is used.	—	●
	Backup Alarm	Output to activate backup alarm uses the controller supply voltage.	—	●

**Programmability
Options (continued)**

Key: ○ Service Tool Configurable ● GUIDE-Programmable

Features / Options (Parameters)

Type	Feature	Description	Service Tool Configurable	Guide-Programmable
Functional features	Steering Profiling Modes	Defines steering input to output profile (8 point profile). Three options: Linear, fixed profile or changes with propel command.	○	—
	Steering Pivot Point Definition	Defines steering pivot point percentage.	○	—
	Steering Pivot Point Deadband Definition	Defines steering pivot point deadband percentage.	○	—
	Propel Input Profiling	Defines propel input to output profile. An 8 point profile is used.	○	—
	Brake Application Delay	Defines the delay before the brake is applied after commands reach zero.	○	—
	Brake Release Delay	Defines time to wait after the brake solenoid is energized before propel can begin.	○	—
	Hill Hold	Defines when to apply the park brake upon detection of uncommanded movement.	○	—
	Motor PPU Setup	Defines pulses/reverse and fault detection parameters.	○	—
	CAN Engine Setup	Defines engine rpm range, ramping, and fault handling.	○	—
	Application Block	Defines propel/steering ramping, soft start, soft end and activates/defines differential steering.	○	—
	Propel Calibration	Defines boundaries for calibration.	○	—
	Pump/Motor Control	Defines motor start point and expected maximum calibration values.	○	—
	Pump/Motor Currents	This allows the user to manually set current range values.	○	—
	Start Calibration Page	Start page for the machine calibration sequence.	○	—

**Programmability
 Options (continued)**

Key: ● Service Tool Configurable ● GUIDE-Programmable

For the GDP Subsystem all plug-ins are included in the software (each plug-in can be enabled or disabled)

Plug-ins (Parameters)

Type	Feature	Description	Service Tool Configurable	GUIDE-programmable
Plug-in	Antistall	User can enable or disable antistall or define antistall parameters.	●	—
	Temperature Derate	User can enable or disable temperature derate or define temperature derate parameters.	●	—
	Tracker	User can enable or disable the tracker or define tracker parameters.	●	—
	Trackstall	Define Trackstall min command parameters.	●	—

Electronic Product Details



F101 879

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.



F101 878

PLUS+1 Expansion Modules

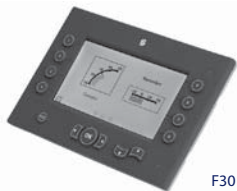
- Expand control system capabilities with CAN-based Input/Output modules.
- 12 and 24 pin housings with five possible configurations.
- Stackable design for optimum mounting flexibility.



F500 036

DP200 and DP250 Displays

- Cost effective alternative to existing analogue gages.
- 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 CAN bus.
 - 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.



F301 609

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.



F101 920

MBS Pressure Sensors

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

**Electronic Product Details
(continued)**



F301 385

Liquit Temperature Sensor

- Brass body construction with integrated connector.



F101 881

KPP Pulse Pickup Speed Sensor

- 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.



F101 431

JS1000 Joystick

- Available in single axis spring-centered and dual axis spring-centered configurations.
- Uses non-contact Hall effect technology.
- Output options: Analog, CAN 2.0B, J1939 protocol.



F101 890

JS6000 Joystick

- Metal construction with a large diameter stainless steel operating shaft.
- Innovative ball and socket gimbal design manufactured from pressure die cast zinc alloys.
- Custom high strength material for the center return cone.
- Optional contactless Hall effect sensing technology.
- Output options: Analog, CAN 2.0B, J1939 protocol.

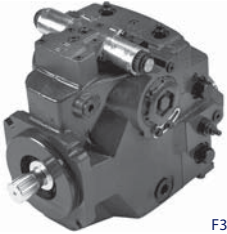


F101 881

Electronic Foot Pedal

- The Electronic Foot Pedal is used for decel and inching functions on vehicles equipped with electronically-controlled engines.
- It provides an electrical signal proportional to the degree of pedal actuation.

Hydraulic Product Details



F301 389

H1 Axial Piston Variable Pumps

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



F301 346

Series 90 High Power Axial Variable Piston Pumps

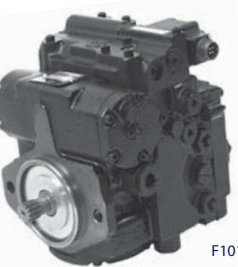
- 7 different displacements.
- Pressures up to 480 bar [6962 psi].



F301 384

H1 Medium Power Integral Tandem Axial Piston Pumps

- 2 integral tandem displacements.
- Optimized for electrohydraulic control.



F101 922

S42 Medium Power Variable Pumps

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



F301 602

H1B Bent Axis Variable Displacement Motors

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

**Hydraulic Product Detail
(continued)**



F301 559

Series 51 Bent Axis Variable Displacement Motors

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



F301 343

Series 90 High Power Axial Piston Motors

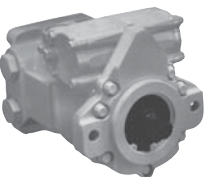
- Two-position motor.
- Short installed length.



F301 351

L and K Frame Medium Power Motors

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



F101 923

Series 40 Medium Power Motors

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



F301 220

Low speed high torque motors

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



Our Products

Open circuit axial piston pumps
Gear pumps and motors
Fan drive systems
Closed circuit axial piston pumps and motors
Bent axis motors
Hydrostatic transmissions
Transit mixer drives
Hydrostatic transaxles
Electrohydraulics
Integrated systems
Microcontrollers and software
PLUS+1™ GUIDE
Displays
Joysticks and control handles
Sensors
Orbital motors
Inverters
Electrohydraulic power steering
Hydraulic power steering
Hydraulic integrated circuits (HIC)
Cartridge valves
Directional spool valves
Proportional valves

Sauer-Danfoss Mobile Power and Control Systems – Market Leaders Worldwide

Sauer-Danfoss is a comprehensive supplier providing complete systems to the global mobile market.

Sauer-Danfoss serves markets such as agriculture, construction, road building, material handling, municipal, forestry, turf care, and many others.

We offer our customers optimum solutions for their needs and develop new products and systems in close cooperation and partnership with them.

Sauer-Danfoss specializes in integrating a full range of system components to provide vehicle designers with the most advanced total system design.

Sauer-Danfoss provides comprehensive worldwide service for its products through an extensive network of Global Service Partners strategically located in all parts of the world.

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