DESCRIPTION

Danfoss S2X Microcontroller is a multi-loop controller that is environmentally hardened for mobile off-highway control system applications. The S2X Microcontroller has the response speed and capacity to control multiple electrohydraulic control systems either as a stand-alone controller or networked with other similar controllers via a high-speed Controller Area Network system.

The S2X is ideally suited for dual-path hydrostatic propel systems incorporating closed-loop speed and horsepower control. Additionally, closed-loop position control systems using servovalves and proportional flow control valves are easily accomplished. Up to four bi-directional servo loops can be used.

The controller can interface with a wide variety of analog and digital sensors such as potentiometers, Hall-effect sensors, pressure sensors, pulse pickups and encoders.

The use of the I/O features and the control actions performed are defined by firmware installed in the S2X's program memory. The firmware is typically installed by downloading the desired code from another computer via the RS232 port. Re-programmability provides a high level of device function flexibility. Either factory or in-field programming is possible.

The S2X controller consists of a circuit board assembly inside of an aluminum die-cast housing. Three connectors, designated as P1, P2 and P3 are provided for electrical connections. P1 (30 pin) and P2 (18 pin) are the main I/O and power connectors; together they mate to the 48 pin board-mounted header, which protrudes through the bottom of the enclosure. P3 is a circular connector for RS232 communications such as reprogramming, displays, printers and terminals.

FEATURES

- Multi-loop control capability for control of 4 bidirectional servo loops or 2 bidirectional and 4 unidirectional loops.

- Powerful 16-bit Intel 8XC196KC microcontroller:
  - fast
  - versatile
  - controls multiple machine functions with fewer parts.

- Controller Area Network (CAN) provides high speed serial communications with up to 16 other CAN compatible devices and meets the speed requirements of SAE network Class C specifications.

- Rugged aluminum die-cast housing withstands the environmental rigors typically found in mobile applications.

- Four-character LED display provides information for setup, calibration, and troubleshooting procedures.

- Flash memory accessible through a dedicated RS232 port. Allows programming without changing EPROMs.

- Hardened power supply operates over the full range of 9 to 36 Volts with reverse battery, negative transient, and load dump protection.

- Convenient RS232 port connector for data communication with other devices such as displays, printers, terminals, or personal computers.

- Expandable via an internal 50-pin connector for custom I/O boards.

ORDERING INFORMATION

- For complete hardware and software ordering information, consult the factory. The S2X ordering number assigns both hardware and software.

- For product structure information see page 5.

- Mating I/O Connector: order Part Number K12674 (bag assembly)

- Mating RS232 Connector: order Part Number K13952 (bag assembly)

SOFTWARE FEATURES

S2X software architecture is designed to utilize Danfoss state-of-the-art application software engineering tools including the Kernel operating system, Danfoss Control Objects and Packages, and WebGPI graphical user's interface. Danfoss software engineering methodology allows application software transportability across microcontroller platforms and facilitates rapid engineering of a wide range of mobile machine control solutions including:

• Engine anti-stall and load controls
• Automotive control
• Wheel assist
• Closed loop speed control
• Pressure control
• Closed loop dual path control
• Position control such as machine elevation, gravity reference and coordinated cylinder position

• Steering control for auto steering and coordinated steering requirements
• Application rate control
• Networking

TECHNICAL DATA

INPUTS
4 Analog (DIN 0, 1, 2, 3) (0 to 5 Vdc) -intended for sensor inputs (10 bit resolution). Protected against shorts to ground.

4 Speed Sensors (PPU 0, 1, 2, 3) (dc-coupled) -for use with solid state zero speed pulse pickups and encoders, any of which can be configured as general purpose analog inputs.

1 Speed Sensor (PPU 4) (ac-coupled) -for use with alternators or variable reluctance pulse pickups.

9 Digital Inputs (DIN) -for monitoring external switch position status for pull up (to 32 Vdc) or pull down (to <1.6 Vdc).

4 Optional Membrane Switches (DIN 12) -located on housing face.

OUTPUTS
2 Low Current - bidirectional current drivers (±275 mA maximum into a 20 ohm load). Protected for shorts to ground.

4 High Current - 3 amp drivers, either ON/OFF or under PWM control.These can be used to drive 12 or 24 Vdc on/off solenoids, servo valves or proportional valves. Short circuit limited to 5 amps.

Optional Display

COMMUNICATION
Controller Area Network (CAN) for communications with other CAN compatible devices. Supports CAN 2.0A/2.0B standards

RS232 port connected through a 6-pin MS connector.

POWER SUPPLY
Voltage range 9 to 36 Vdc.
5 Vdc regulator for external sensor power (up to 0.5 amp) which is short-circuit protected.

MEMORY
See Hardware Structure, page 5.

LEDs
4-character alphanumeric LED display; each character is a 5x7 dot matrix.
2 LED indicators, one LED used as a power indicator, the other LED under software control for use as fault or status indication.

ELECTRICAL CONNECTIONS
48-pin board-mounted Metri-Pak I/O connector mates with a 30-pin and 18-pin cable connector.
6-pin circular MS connector for RS232 communication.

ENVIRONMENTAL

OPERATING TEMPERATURE
-40°C to +70°C (-40° F to 158° F)

MOISTURE
Protected against 95% relative humidity and high pressure washdowns

VIBRATION
5 to 2000-Hz with resonance dwell for 1 million cycles for each resonant point run from 1 to 10 gs
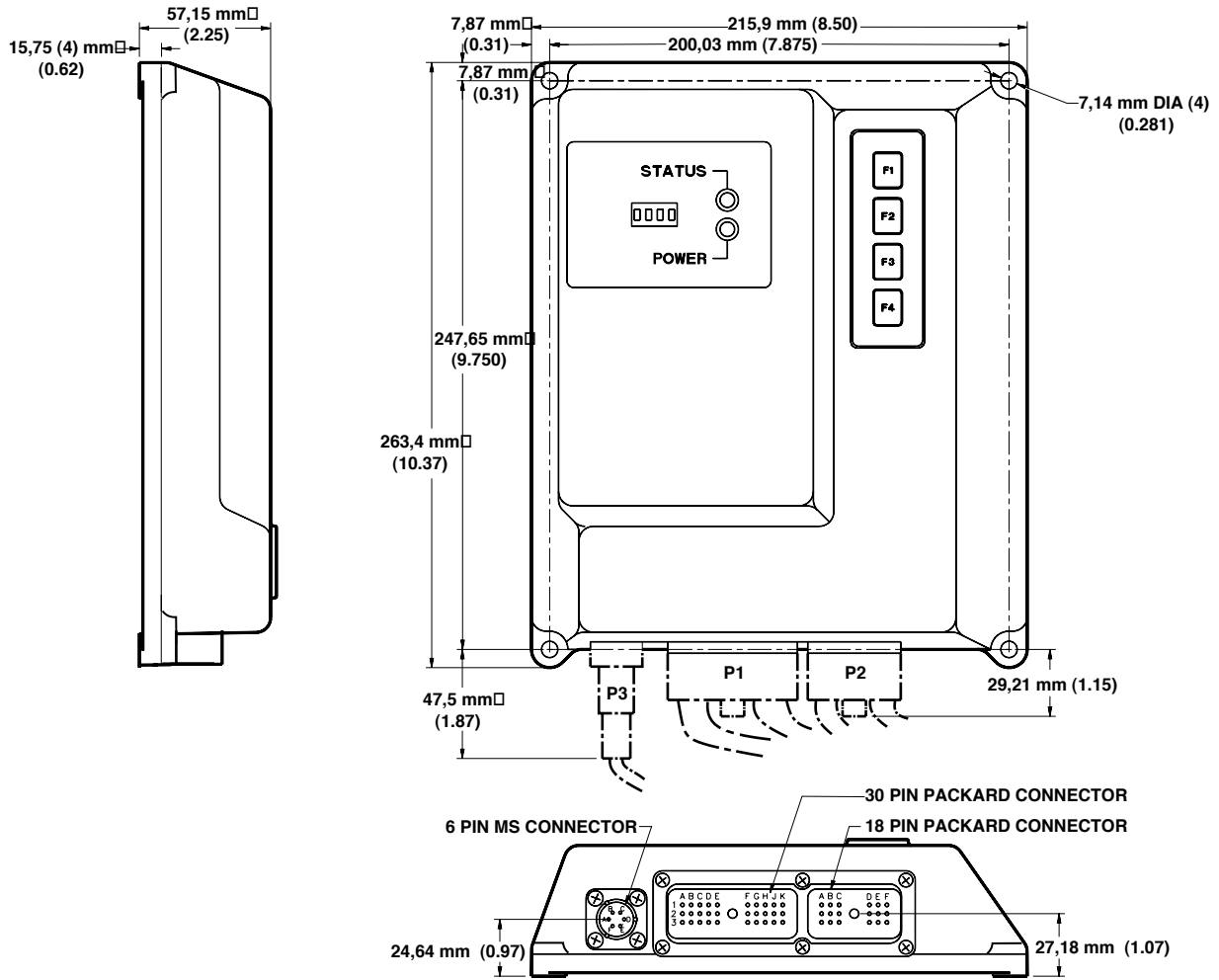
SHOCK
50 gs for 11 ms in all 3 axes for a total of 18 shocks

ELECTRICAL

Withstands short circuits, reverse polarity, over voltage, voltage transients, static discharges, EMI/RFI and load dump.

DIMENSIONS

57,15 mm□
(2.25)

15,75 (4) mm□
(0.62)

7,87 mm□
(0.31)

215,9 mm (8.50)

200,03 mm (7.875)

7,87 mm
(0.31)

7,14 mm DIA (4)
(0.281)

STATUS

POWER

F1
F2
F3
F4

247,65 mm□
(9.750)

263,4 mm□
(10.37)

P3

P1

P2

47,5 mm□
(1.87)

29,21 mm (1.15)

30 PIN PACKARD CONNECTOR

6 PIN MS CONNECTOR

18 PIN PACKARD CONNECTOR

24,64 mm (0.97)

27,18 mm (1.07)

3014

Dimensions in Millimeters (Inches).

**Danfoss recommends standard installation of the controller to be
in the vertical plane with connectors facing down.**

CONNECTOR PINOUTS

P3 RS232 Connector

TXD (Transmit Data)	A	
RXD (Receive Data)	B	
5V Sensor Power Out	C	
Ground	D	
/ BOOT	E	
Ground	F	
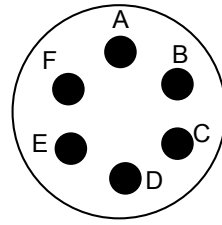
P3

P1 30 Pin Metri-Pack Connector

|	
5V Sensor Power Out	A1
Analog In 0	A2
Sensor Gnd	A3
5V Sensor Power Out	B1
PPU 4 (AC Speed In)	B2
Sensor Gnd	B3
5V Sensor Power Out	C1
Analog In 3	C2
Sensor Gnd	C3
5V Sensor Power Out	D1
Analog In 1	D2
Sensor Gnd	D3
5V Sensor Power Out	E1
Digtal In 7	E2
Sensor Gnd	E3
5V Sensor Power Out	F1
Analog In 2	F2
Sensor Gnd	F3
5V Sensor Power Out	G1
PPU 3/Analog In 4	G2
Sensor Gnd	G3
5V Sensor Power Out	H1
PPU 0/Analog In 7	H2
Sensor Gnd	H3
Low Current Valve Out 0+	J1
PPU 1/Analog In 6	J2
Low Current Valve Out 0 -	J3
Low Current Valve Out 1+	K1
PPU 2/Analog In 5	K2
Low Current Valve Out 1 -	K3
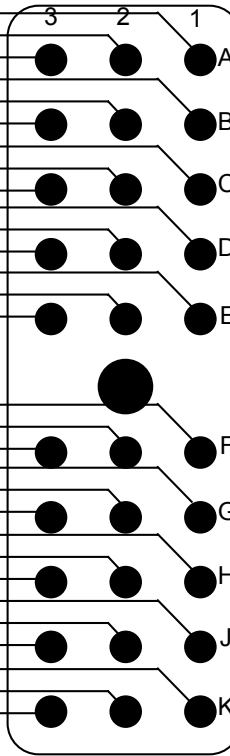
P1

P2 18 Pin Metri-Pack Connector

Digital In 2	A1
Digtal Ground	A2
CAN-HIGH	A3
Digital In 5	B1
CAN-SHLD	B2
Digital In 12	B3
Digital In 3	C1
Digital In 0	C2
CAN-LOW	C3
Digital In 4	D1
High Current Out 1	D2
Digital In 1	D3
Battery --	E1
Digital In 6	E2
High Current Out 3	E3
Battery +	F1
High Current Out 2	F2
High Current Out 0	F3
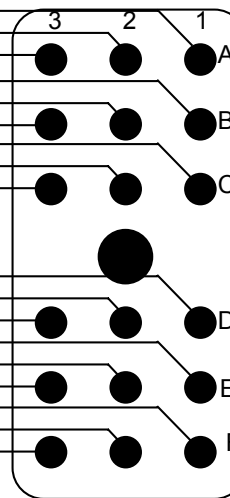
P2

HARDWARE STRUCTURE

S2X XX XX X X X X X

S2X CONTROLLER

OUTPUTS
60 (2) 200 mA bidir + 4, 3 Amp unidir
     (0) with fault shutdown
61 (2) 200 mA bidir + 4, 3 Amp unidir
     (1) with fault shutdown
62 (2) 200 mA bidir + 4, 3 Amp unidir
     (2) with fault shutdown
63 (2) 200 mA bidir + 4, 3 Amp unidir (Standard)
     (3) with fault shutdown
64 (2) 200 mA bidir + 4, 3 Amp unidir
     (4) with fault shutdown

INPUTS
50 (4) 5V analog, (4) dc PPU
     (1) ac PPU (low res.)
51 (5) 5V analog, (3) dc PPU
     (1) ac PPU (low res.)
52 (6) 5V analog, (2) dc PPU
     (1) ac PPU (low res.)
53 (7) 5V analog, (1) dc PPU
     (1) ac PPU (low res.)
54 (8) 5V analog, (0) dc PPU
     (1) ac PPU (low res.)
55 (5) 5V analog, (3) dc PPU
     (1) ac PPU (high res.)
     PPU 3/analog 4 has fault detection
56 (5) 5V analog, (3) dc PPU
     (1) ac PPU (high res.) (Standard)
57 (6) 5V analog, (2) dc PPU
     (1) ac PPU (high res.)
58 (7) 5V analog, (1) dc PPU
     (1) ac PPU (high res.)
59 (8) 5V analog, (0) dc PPU
     (1) ac PPU (high res.)
70 (6) 5V analog, (2) dc PPU, (1) ac PPU (high res.)
     PPU1 and PPU2 are PPUs
     PPU0 and PPU3 are analog

CUSTOM ORDERS
1 Standard
2 Customer Specific
3 Expansion

DIODES
0 Diodes (Standard)
1 No Diodes

MEMORY
1 64 K Flash Program (Standard)
   memory, 8K RAM
   512 byte non-volatile
   serial E data memory
2 128 K Flash Program
   memory, 8 K Ram
   512 byte non-volatile
   serial E^2 data memory

COMMUNICATIONS
1 RS 232, CAN,
   Zinc Cobalt Connector
2 RS 232 CAN (Standard),
   Cadmium Connector

OPERATOR OPTIONS
1 No display,
   No switches
2 (4) character display (Standard),
   No switch pad
3 (4) character display and
   (4) switch pad

Hardware model example for a standard unit: S2X635622101

CUSTOMER SERVICE

NORTH AMERICA

ORDER FROM

Danfoss (US) Company
Customer Service Department
3500 Annapolis Lane North
Minneapolis, Minnesota 55447
Phone: (763) 509-2084
Fax: (763) 559-0108

DEVICE REPAIR

For devices in need of repair, include a description of the problem, a copy of the purchase order and your name, address and telephone number.

RETURN TO

Danfoss (US) Company
Return Goods Department
3500 Annapolis Lane North
Minneapolis, Minnesota 55447

EUROPE

ORDER FROM

Danfoss (Neumünster) GmbH & Co.
Order Entry Department
Krokamp 35
Postfach 2460
D-24531 Neumünster
Germany
Phone: 49-4321-8710
Fax: 49-4321-871355