

56XS1 AC/DC Power Supply

2,000 Watt-Watt Ruggedized Power Supply
Conduction-Cooled, Single Output



*Proudly made
in the USA*

Description

NAI's 56XS1 is a high power density, low profile, AC/DC switch mode power supply in a 2,000 Watt single output configuration. The 56XS1 accepts **either a three-phase, AC input or a +270Vdc input**. This COTS unit provides a single full-power output (2,000 Watts) at a baseplate temperature of +85°C.

Standard features include remote error sensing, INHIBIT, Input and Output Monitoring, Overtemp Warning & Shutdown and protection against transients, over voltage, over-current, and short-circuits. Optional Current Share and RS485 Communication and Control are available.

This conduction-cooled power supply is designed with NAVMAT component derating for rugged defense and industrial applications. It is also designed to meet the many harsh environmental requirements of military applications.

Features

- Ideal for rugged, conduction-cooled, military applications
- High Power Density, High Efficiency
- 3 Phase Input
- Designed and Manufactured Per NAVMAT Guidelines
- Remote Error Sensing
- Output INHIBIT
- Input and Output Monitor
- Over Temp Warn & Shutdown
- Current Share with monitoring (*Optional*)
- RS-485 Communication (*Optional*)
- Standalone EMI Compliance Per MIL-STD-461F
- Transient Protection per MIL-STD-704F
- Environmentals per Mil-Std 810G
- Sealed for mitigation of liquid intrusion RTCA DO-160D



Electrical Specifications

AC Input Characteristics	
Input	AC input: 115 VAC, 3 phase, L – N or +270Vdc input (220 to 320Vdc Range)
Input Frequency Range (For AC input)	47 Hz to 440 Hz
EMI/RFI	Per MIL-STD-461F; CE102, CS101, CS114, CS115, CS116, RE102, RS103
Input Transient Protection	Per MIL-STD-704F
Output Power	Up to 2,000 Watt
Output Voltage	Factory configurable: +12V, +15V, +24V, +28V, +32V or +48Vdc (Limited to 72Amps Max)
Efficiency	90% typical
Line Regulation	Within 0.5% for low to high line changes at constant load
Load Regulation	0.5% for 0 to 100% of rated load at nominal input line
PARD (Noise and Ripple)	1% p-p (20 MHz bandwidth)
Load Transient Recovery	Output voltage returns to regulation limits within 0.5 msec (max), half to full load
Load Transient Under/Overshoot	5% max
Short Circuit Protection	Continuous short circuit with auto recovery
Current Limiting	120% $\pm$ 10% constant current limit
Over Voltage Protection	Automatic electronic shutdown if voltage exceeds 125% $\pm$ 10%; OV is latching, input power must be removed to reset OV.
Remote Error Sensing	Compensates for up to 0.5 V drop on output leads
INHIBIT*	Ground or Logic 0 Inhibits the output; A floating input acts as a logic 1 (output on)
Current Share (Optional)	Allows for increased system wattage or redundancy by connecting 2 or more units
Share_OK* (Optional)	Active Low Signal; High = Share Fault Condition, Low = Sharing Properly. (Can be used to drive LED). Available with Current Share Option
Power Fail Warning (PFW)	Integrated into BIT
BIT	Open collector output capable of sinking 50 mA. Output will be low (conducting) when output is within 5% of nominal value and input voltage is sufficient.
OverTemp	Shutdown at baseplate temperature of 90°C $\pm$ 5°; Automatic recovery at 75°C $\pm$ 5°
RS-485 Communication (Optional)	Communication and Control
Isolation Voltage	1000 VDC input to output and input to case; 200 VDC output to case
Insulation Resistance	50 Mega Ohm at 50 VDC

All specifications are subject to change without notice.

Page 2 of 10

Additional Specifications

Physical/Environmental	
Temperature Range	Operating: -55°C to +85°C; Storage: -55°C to +100°C; (temperature measured at baseplate, conduction-cooled via baseplate only)
Temperature Coefficient	0.01% per °C max
Shock	30 G's each axis per MIL-STD-810G, Method 516.6, Procedure 1; Hammer shock per MIL-S 901; ½ sine wave
Acceleration	6 G's per MIL-STD-810G, Method 513.6, Procedure II; 14 G's per Procedure 1
Vibration	Per MIL-STD-810G, Method 514.6, Procedure 1A
Reliability (MTBF)	200,000 hours, ground benign, at 40°C baseplate
Humidity	95% at 71°C per MIL-STD-810G, Method 507.5 (non-condensing)
Altitude	40,000 feet per MIL-STD-810G, Method 500.5, Category 6 Equipment
Dimensions	Refer to mechanical layout diagram
Salt & Fog	Per MIL-STD-810G, Method 509.5
Sand/Dust/Fungus	Per MIL-STD-810G, Method 510.5; Per MIL-STD-810G, Method 508.6
Enclosure	Aluminum chassis; Cover to Baseplate and cover sealed for mitigation of liquid intrusion per RTCA DO-160D
Finish	Yellow Chem film IAW MIL-DTL-5541, Type I, Class 3
Interface	See Connector Specifications Table
Weight	6.5lbs Typical

All specifications are subject to change without notice.

Connector Specifications

Connector	Part # - Series
Input Unit Connector	D38999/20WD5PN or Equiv.
Input Mating Connector*	D38999/26WD5SN
Output Unit Connector Codes 01 to 05	D38999/20WE35SN or Equiv.
Code 06 & Code 09	D38999/20WE35SN Filtered or Equiv.
Output Mating Connector*	D38999/26WE35PN

*Mating Connectors Not Supplied

Output Power*

Output Voltage	Output Current	Output Wattage
+12Vdc	72Amps	864 Watts
+15Vdc	72Amps	1,080 Watts
+24Vdc	72Amps	1,728 Watts
+26Vdc	72Amps	1,872 Watts
+28Vdc	72Amps	2,016 Watts
+32Vdc	62Amps	1,984 Watts
+48Vdc	42Amps	2,016 Watts

*Refer to ordering information

Input Pinout

Pin #	Function
A	115VAC – PHASE A or +270Vdc
B	115VAC – PHASE B or 270Vdc Return
C	115VAC – PHASE C
D	NEUTRAL
E	CHASSIS

Output / Signaling Pinout*

Pin #	Code 01 Standard	Code 02 Current Share	Code 03 Comm. & Control	Pin #	Code 01 Standard	Code 02 Current Share	Code 03 Comm. & Control
1	CHASSIS	CHASSIS	CHASSIS	29	VOUT RTN	VOUT RTN	VOUT RTN
2	INHIBIT	INHIBIT	INHIBIT A	30	VOUT RTN	VOUT RTN	VOUT RTN
3	SPARE	SHARE SIGNAL	INHIBIT B	31	VOUT RTN	VOUT RTN	VOUT RTN
4	+SENSE	+SENSE	INHIBIT C	32	+VOUT	+VOUT	+VOUT GROUP B
5	SENSE RTN	SENSE RTN	INHIBIT D	33	+VOUT	+VOUT	+VOUT GROUP C
6	+VOUT	+VOUT	+VOUT GROUP A	34	+VOUT	+VOUT	+VOUT GROUP C
7	RESERVED	RESERVED	RESERVED	35	+VOUT	+VOUT	+VOUT GROUP C
8	BIT	Share OK	BIT	36	VOUT RTN	VOUT RTN	VOUT RTN
9	BIT RTN	BIT RTN	BIT RTN	37	VOUT RTN	VOUT RTN	VOUT RTN
10	+VOUT	+VOUT	+VOUT GROUP A	38	VOUT RTN	VOUT RTN	VOUT RTN
11	+VOUT	+VOUT	+VOUT GROUP A	39	VOUT RTN	VOUT RTN	VOUT RTN
12	+VOUT	+VOUT	+VOUT GROUP A	40	+VOUT	+VOUT	+VOUT GROUP C
13	VOUT RTN	VOUT RTN	VOUT RTN	41	+VOUT	+VOUT	+VOUT GROUP C
14	VOUT RTN	VOUT RTN	VOUT RTN	42	+VOUT	+VOUT	+VOUT GROUP C
15	VOUT RTN	VOUT RTN	VOUT RTN	43	VOUT RTN	VOUT RTN	VOUT RTN
16	RS485 A**	RS485 A**	RS485 A	44	VOUT RTN	VOUT RTN	VOUT RTN
17	+VOUT	+VOUT	+VOUT GROUP A	45	VOUT RTN	VOUT RTN	VOUT RTN
18	+VOUT	+VOUT	+VOUT GROUP A	46	VOUT RTN	VOUT RTN	VOUT RTN
19	+VOUT	+VOUT	+VOUT GROUP B	47	+VOUT	+VOUT	+VOUT GROUP D
20	+VOUT	+VOUT	+VOUT GROUP B	48	+VOUT	+VOUT	+VOUT GROUP D
21	VOUT RTN	VOUT RTN	VOUT RTN	49	+VOUT	+VOUT	+VOUT GROUP D
22	VOUT RTN	VOUT RTN	VOUT RTN	50	VOUT RTN	VOUT RTN	VOUT RTN
23	VOUT RTN	VOUT RTN	VOUT RTN	51	VOUT RTN	VOUT RTN	VOUT RTN
24	RS485 B**	RS485 B**	RS485 B	52	VOUT RTN	VOUT RTN	VOUT RTN
25	+VOUT	+VOUT	+VOUT GROUP B	53	+VOUT	+VOUT	+VOUT GROUP D
26	+VOUT	+VOUT	+VOUT GROUP B	54	+VOUT	+VOUT	+VOUT GROUP D
27	+VOUT	+VOUT	+VOUT GROUP B	55	VOUT RTN	VOUT RTN	VOUT RTN
28	VOUT RTN	VOUT RTN	VOUT RTN				

*Pinouts are defined according to the Option Code chosen. i.e. Each Option uses a different pinout and options cannot be combined.

**On models without Command and Control Option, these pins should be left floating

RS485 Communication

1. Hardware Interface

Electrical interface is based on RS485 at 230,400 bps Baud Rate.

2. Address

The RS485 Address is 7 bits. Default address is 0x22.

3. Data Read – Get Sensor Reading results

3.1. Request

Slave Addr	Cmd Byte 0	Cmd Byte 1	Cmd Byte 2	Cmd Byte 3	Cmd Byte 4	Cmd Byte 5	Zero Checksum*
------------	------------	------------	------------	------------	------------	------------	----------------

*NOTE: Slave Addr should not be included in the Zero Checksum calculation.

NOTE: PSU will respond to one command every 100ms.

3.2. Response

Slave Addr	Data Bytes
------------	------------

4. Commands

Sensor #	Name	Description
45h 4Eh 0Xh 00h 00h 00h YYh	Enable Command	Enables/Disables Outputs A-D
45h 4Eh 53h 00h 00h 00h 1Ah	PSU Status	2 byte response. Inhibit pin state / Outputs enable state / Outputs PG* Flt*
4Eh 53h 41h 52h XXh 00h YYh	New PSU address	Sets a new slave address for the PSU. Default is 0x22.

4.1. Enable Command

Address Byte	Cmd Byte 0	Cmd Byte 1	Cmd Byte 2	Cmd Byte 3	Cmd Byte 4	Cmd Byte 5	Zero Checksum
0x22	0x45	0x4E	0x0X	0x00	0x00	0x00	0xYY

Cmd Byte 2 / Checksum Values

Cmd Byte 2	Output Status				Zero Checksum
	A	B	C	D	
0x00	0	0	0	0	0x6D
0x01	1	0	0	0	0x6C
0x02	0	1	0	0	0x6B
0x03	1	1	0	0	0x6A
0x04	0	0	1	0	0x69
0x05	1	0	1	0	0x68
0x06	0	1	1	0	0x67
0x07	1	1	1	0	0x66

Cmd Byte 2	Output Status				Zero Checksum
	A	B	C	D	
0x08	0	0	0	1	0x65
0x09	1	0	0	1	0x64
0x0A	0	1	0	1	0x63
0x0B	1	1	0	1	0x62
0x0C	0	0	1	1	0x61
0x0D	1	0	1	1	0x60
0x0E	0	1	1	1	0x5F
0x0F	1	1	1	1	0x5E

4.2. PSU Status

Address Byte	Cmd Byte 0	Cmd Byte 1	Cmd Byte 2	Cmd Byte 3	Cmd Byte 4	Cmd Byte 5	Zero Checksum
0x22	0x45	0x4E	0x53	0x00	0x00	0x00	0x1A

Response

Byte	Bit	Description	Notes
0 (0x22)		Slave Addr	
1	7	HW Inhibit D Status	When an Enable command is sent, PSU is in SW priority A change in state of any of the inhibit pins will set the PSU to HW priority.
	6	HW Inhibit C Status	
	5	HW Inhibit B Status	
	4	HW Inhibit A Status	
	3	SW Enable D Status	
	2	SW Enable C Status	
	1	SW Enable B Status	
	0	SW Enable A Status	
2	7	Output D Fault Status	Fault = 0, Power Good = 0 : No Fault, Output Enabled Fault = 1, Power Good = 0 : Output Disabled Fault = 1, Power Good = 1 : Fault Occurred, Output Disabled
	6	Output D Power Good Status	
	5	Output C Fault Status	
	4	Output C Power Good Status	
	3	Output B Fault Status	
	2	Output B Power Good Status	
	1	Output A Fault Status	
	0	Output A Power Good Status	

4.3. New PSU Address

Address Byte	Cmd Byte 0	Cmd Byte 1	Cmd Byte 2	Cmd Byte 3	Cmd Byte 4	Cmd Byte 5	Zero Checksum
0x50	0x4E	0x53	0x41	0x52	0xFF*	0x00	0xYY

***NOTE: 0x20, 0x2C and 0x50 are reserved addresses and cannot be used as the PSU slave address.**



Ordering Information

The diagram illustrates the structure of a part number, breaking it down into five main components: **56**, **X**, **S1**, **XXX**, and **Opt Code**.

- 56**: Series 56 = AC/DC
- X**: Wattage = 2,000 Watts Max
- S1**: Unit Configuration
- XXX**: Voltage options

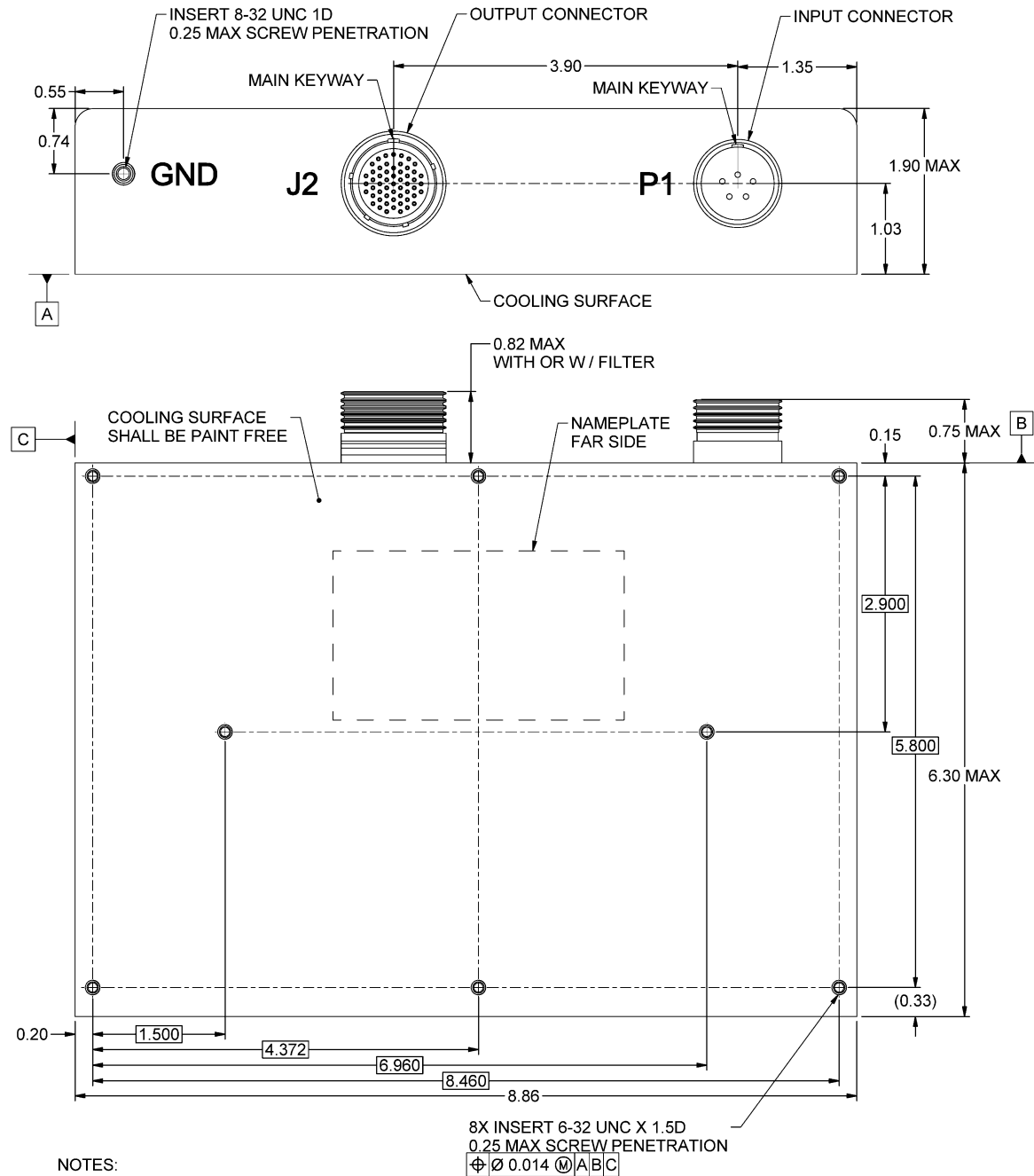
012	= +12Vdc
015	= +15Vdc
024	= +24Vdc
026	= +26Vdc
028	= +28Vdc
032	= +32Vdc
048	= +48Vdc
- Opt Code**: See Code Table and choose code # (Code 00 = Standard Options)

Option Codes*

Code	Function	Description	Pinout Code*
01	Standard	No Additional options	01
02	Current Share Option	Allows multiple units to be paralleled for increased output current or for redundancy. Comes with Share_OK* monitoring	02
03	RS-485 Command & Control Option	Provides RS-485 communication for status & control. The output can be controlled in 4 fault isolated groups (A - D) - Each group has an individual discrete inhibit - Each group has overload protection up to 25A - Each group can report status and be controlled via RS485	03
04	- Current Share - Delta Input Configuration - Modified INHIBIT	- Allows multiple units to be paralleled for increased output current or for redundancy. Comes with Share_OK* monitoring - Delta Input Configuration (L-L) - INHBIT* is Configured with the logic as follows: Floating the PS output is inhibited, and Logic 1 (5 volts) the output is enabled. Referenced to Vout RTN	02
05	Not Available	Not Available	-
06	Filtered Pin Output Connector	Connector type D38999/20WE35SN Filtered or Equiv.	01
07	Filtered Pin Output Connector with Current Share	- Connector type D38999/20WE35SN Filtered or Equiv. - Allows multiple units to be paralleled for increased output current or for redundancy. Comes with Share_OK* monitoring	02
08	- RS-485 Command & Control Option - Delta Input	- RS-485 Command & Control Option; output can be controlled in 4 fault isolated groups (A - D) - Each group has an individual discrete inhibit - Each group has overload protection up to 25A - Each group can report status and be controlled via RS485 - AC Input is 3 Phase DELTA Configuration	
09	- Current Share Option - Filtered Pin Output Connector - Special Connector Marking	- Allows multiple units to be paralleled for increased output current or for redundancy. Comes with Share_OK* monitoring - Connector type D38999/20WE35SN Filtered or Equiv. - Input connector is marked "J1" instead of "P1"	02
10	Standard Unit, No Current Share	- Environmental gasket between top cover and baseplate as well as additional sealing of cover for mitigation of liquid intrusion - Over Current will latch output off once output voltage decreases to approx. 22Vdc. Can only be reset by cycling input power	01
11		Modified to provide Output within 22V – 29V (MIL-STD-704F steady state limits) when subjected to normal transients per MIL-STD-704A category B on the 115V input with a 40A Maximum Load.	01

*Refer to Output / Signaling table. Pinouts are defined according to the Option Code chosen. i.e. Each Option uses a different pinout and options cannot be combined.

Mechanical Layout Diagram



- NOTES:
1) DIMENSIONS ARE IN INCHES.
2) TOLERANCE:
X.XX ± 0.02 IN
X.XXX ± 0.01 IN

56XS1.idw