5143 SCA1000-FM-A0

Part Number | Amplifier Name

Revision 0.a Release Date January, 2008
Revision Notes Initial release

Technical Specifications Summary

Frequency Range:	87.5 - 108 MHz	Gain:	30dB
Pout:	1000 Watts CW	Efficiency:	68%
Class:	C	Temperature Range:	0 to 55°C
Supply Voltage:	220VAC, 1 Phase	Max VSWR:	3:1

Amplifier General Description

The SCA series of solid state power amplifiers offer high reliabillity and full set of standard features. Designed to be driven from a 10W FM Broadcast Quality Exciter, the SCA1000-FM series will deliver up to 1250W output in a compact 5-U EIA 19” rackmount cabinet.

Standard features include automatic power control, predictive automatic fan fail detection, VSWR monitoring and automatic foldback, graceful power degradation, serial data communications and control, analog outputs for power, voltage, current (soft configurable), complete front panel information screens. The amplifier features SCA firmware which allows for operation even in the event of circuit fault. This includes damaged power supply, damaged power amplifiers, damaged fans, blocked airflow, VSWR problems.

The power amplifier is based upon sixth generation, +28V DC Silicon LDMOS technology which operates at a DC efficiency of 78% typical! In a standard configuration, this translates into better than 65% system efficiency. Four amplifiers are combined with an isolated broadband combiner, and two power factor correct switching power supplies provide system power.

The chassis uses our oversized military grade heatsink capable of operation beyond most amplifiers. This bonded fin heatsink will allow full power operation at altitude up to 55 °C. Because all RF amplifier sections are sealed from external airflow, outside cooling air may be used saving costly air conditioning requirements. The entire system is built in a modular fashion with all high power components placed in the bottom of the amplifier and power supply, control, low power components in the top of the amplifier. The amplifier maintains an M.T.T.R. (mean time to repair) of better than 60 minutes. For common circuit faults, typical repair time is 25 minutes, and no soldering is required!

Amplifier Picture

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Electrical Specifications

RF Specifications

Parameter	Min	Typ	Max	Units	Notes
Frequency	87.5		108	MHz	
Pout	250		1000	W, CW	
Output VSWR			2:1		For full rated power delivered
Output VSWR			3:1		Power gracefully reduced from 2:1
Maximum VSWR			5:1		Amplifier is disabled above this VSWR
Power Input	5	10	25	W, CW	
Gain	10		21	dB	
Gain Variation			±1	dB	ALC off, over frequency
Vsupply		26		V, DC	Internal Module Supply Voltage
Drain Current			64	A, DC	
Efficiency	73	80		%	Module - DC to RF
Input VSWR			1.5:1		
Insertion Phase Variation		±5		°	Unit to unit
Spurious Emissions		-80	-60	dBc	
Harmonics		-70	-60	dBc	After LPF

All specifications valid for 50 Ω load

Environmental, Mechanical, Interface

Parameter	Min	Typ	Max	Units	Notes
Form Factor		19" IEC Rackmount Cabinet 5U Height 24" Depth			
Weight		85		lbs	Including handles, Connectors
Operating Temperature	0		55	°C	
Storage Temperature	-20		85	°C	
Altitude	0		12000	Ft ASL	Derate Max Operating Temperature to 45°C linearly from 10000 Ft to Max
Relative Humidity	5		95	%	Non condensing
Shock		Designed to meet MIL-810-C Method 516.2 Proc 2			
Vibration		Normal Truck Transport			
Control Connector		DB-9 Female			Control, Communications, Status
Mains AC Connector		HBL-30			
RF Input Connector		N-Female			
RF Output Connector		7/8 EIA Flange			Optional 7/16 DIN
Interface - Data		DB-9 Female			RS 232. Optional 10 Base T Ethernet
Interface - Analog		3 x Pluggable Terminal Block			
Monitor		BNC-Female			Optional Accessory

Absolute Maximum Ratings

Parameter	Value	Units	Notes
Operating Voltages	180 - 264	V AC	Single Phase, 47 - 63 Hz
Maximum Power Consumption	2000	W	
Maximum Current	10	A AC	At 220V, protected with 20A Ckt Breaker
Maximum Input Power	25	W, CW	For normal operation at max power
Maximum Input Power	70	W, CW	No amplifier damage
Load mismatch survival	∞ : 1		

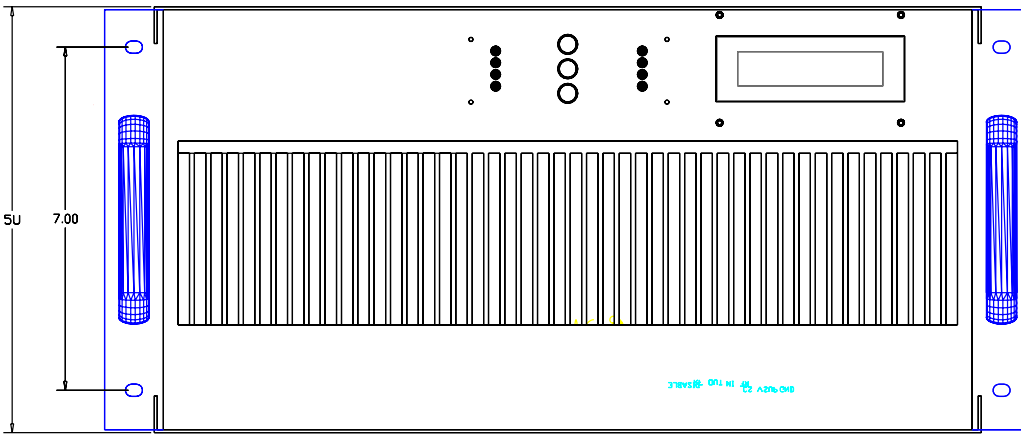
ALC & Detector Information

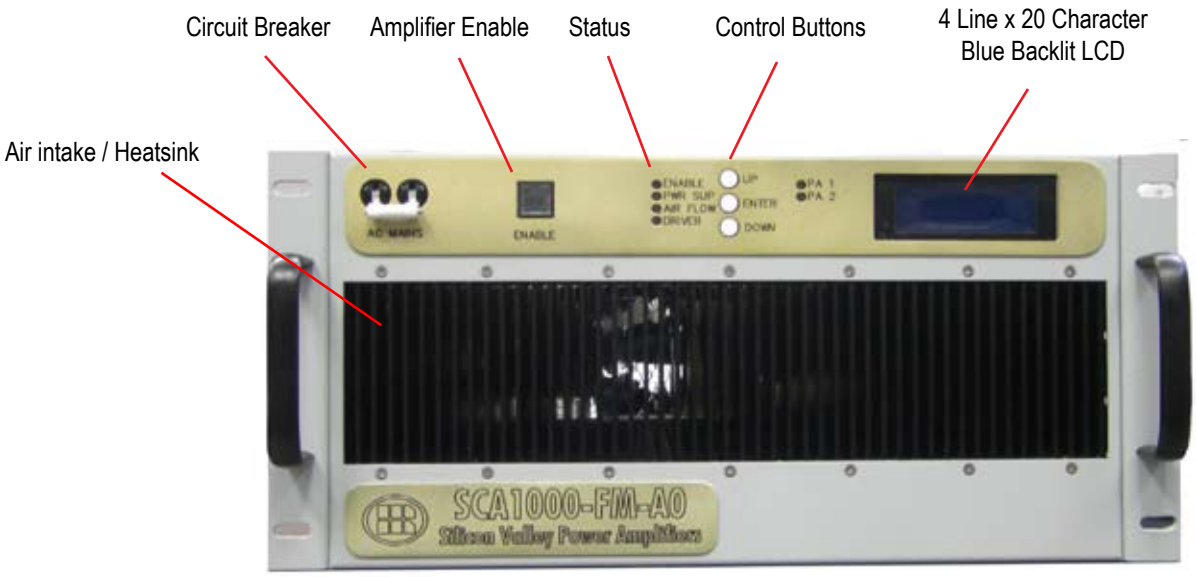
Parameter	Min	Typ	Max	Units	Notes
Detector Type		Logarithmic Amplifier, RMS			
ALC Modes		Constant Gain (ALC Disabled) Constant Power			
Input Attenuator Range		0 - 14dB, continuous			
Forward Power Increment		5		Watts	
Forward Power Accuracy		±25	±50	Watts	1000W, 50Ω
Reflected Power Increment		5		Watts	
Reflected Power Accuracy		±12	±25	Watts	150W, 50Ω
Input Power Accuracy		±1.0		dB	
Forward Power Trip - Hardware	1100		1150	Watts	50Ω
Reflected Power Trip - Hardware	200		250	Watts	Referenced to 50Ω
Forward Power Trip - Software		1050		Watts	50Ω
Reflected Power Trip - Software		175		Watts	Referenced to 50Ω

Amplifier Features:

- RF Modules are easy to service - connectorized RF In, RF Out, Power and IO
- Power supplies are easy to service - slide out from single connector
- Simple wiring harnesses, all modules have connectors
- Sealed RF compartments - no airflow over RF electronics
- Multiple interface options, including RS232, Ethernet, Analog and Digital I/O
- Broadband Operation - no tuning required for frequency change
- Simple calibration routines
- All functions available by remote control and front panel operation

Front View

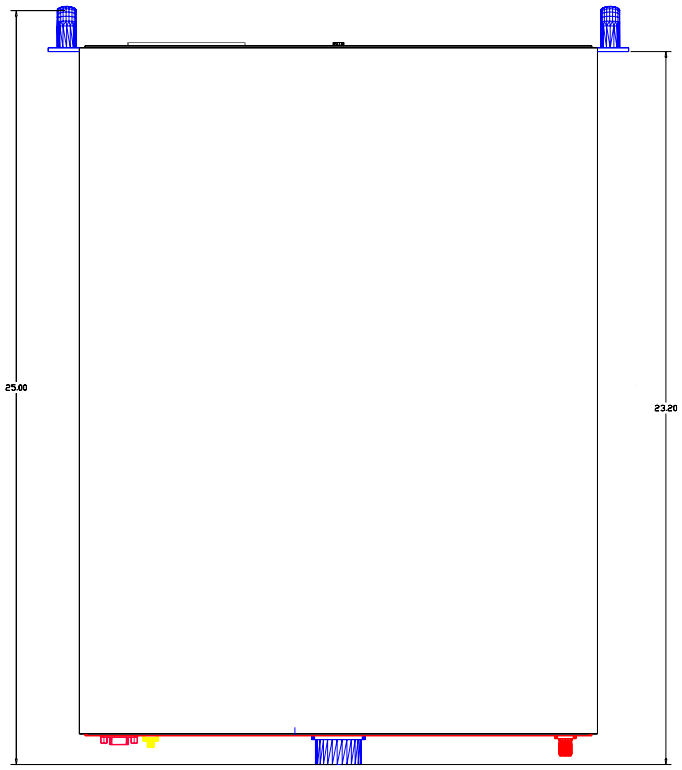




LED Status Indicators:
Enable: Green Active, Red Off, Amber Warning Condition
Power Supply: Green Active, Red Fault
Air Flow: Green Fans ok, Amber Fan Problem, Red Fans Failed
Driver: Green Drive ok, Amber Drive hi / lo, Red No Drive
PA x: Green: Active, Amber - Overtemp or Current, Red: Failed

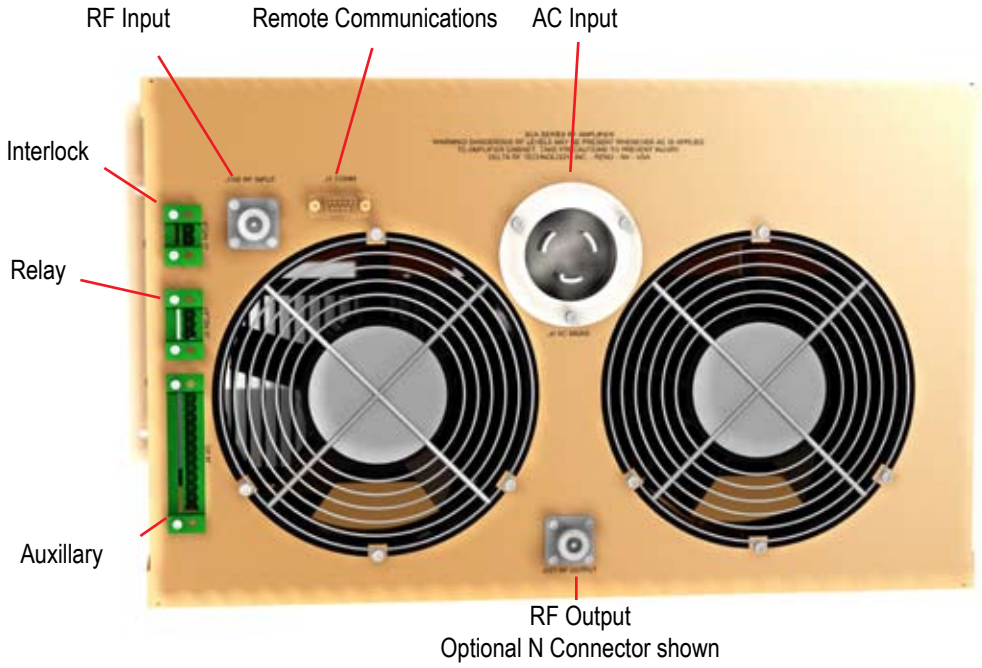
AMPLIFIER ENABLE BUTTON:
Always lights red and indicates 'OFF' when circuit breaker is off or switch is in off position.
When Circuit Breaker is ON and switch is in on position, lights green and indicates 'ON'

Top View

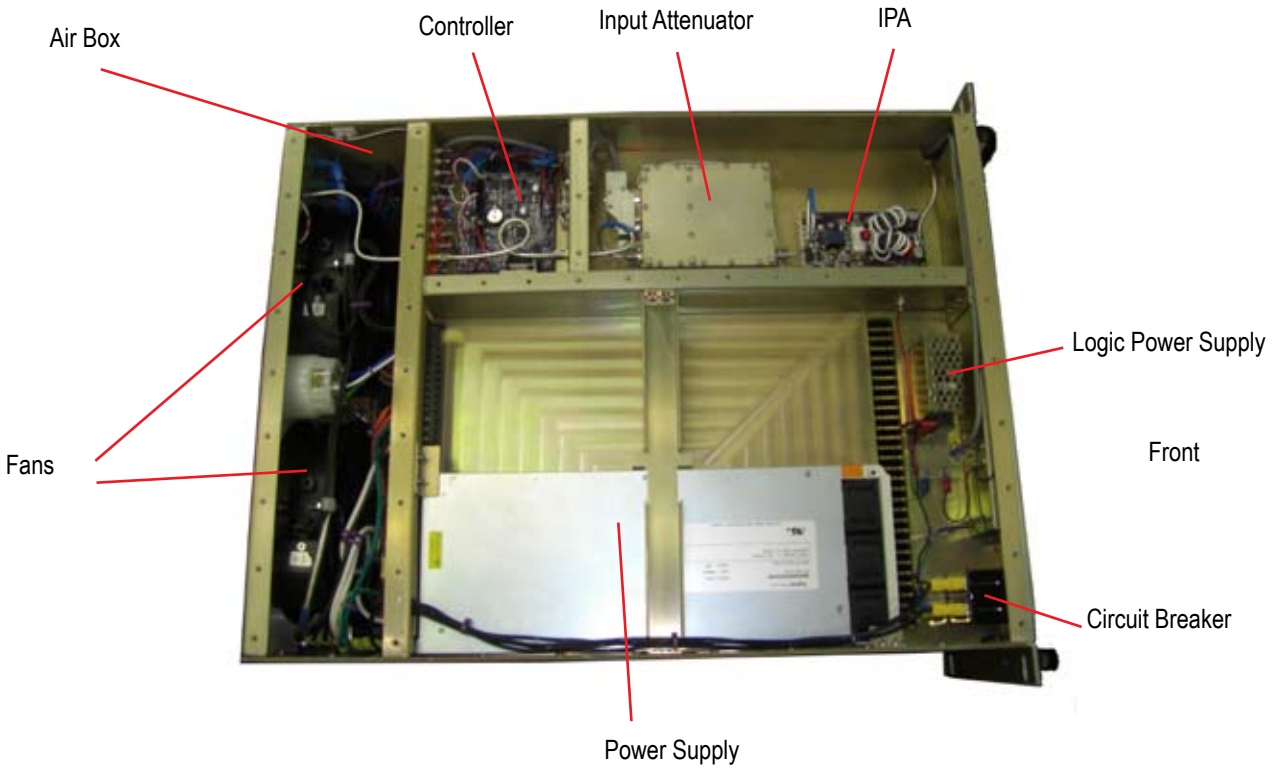


Rear View

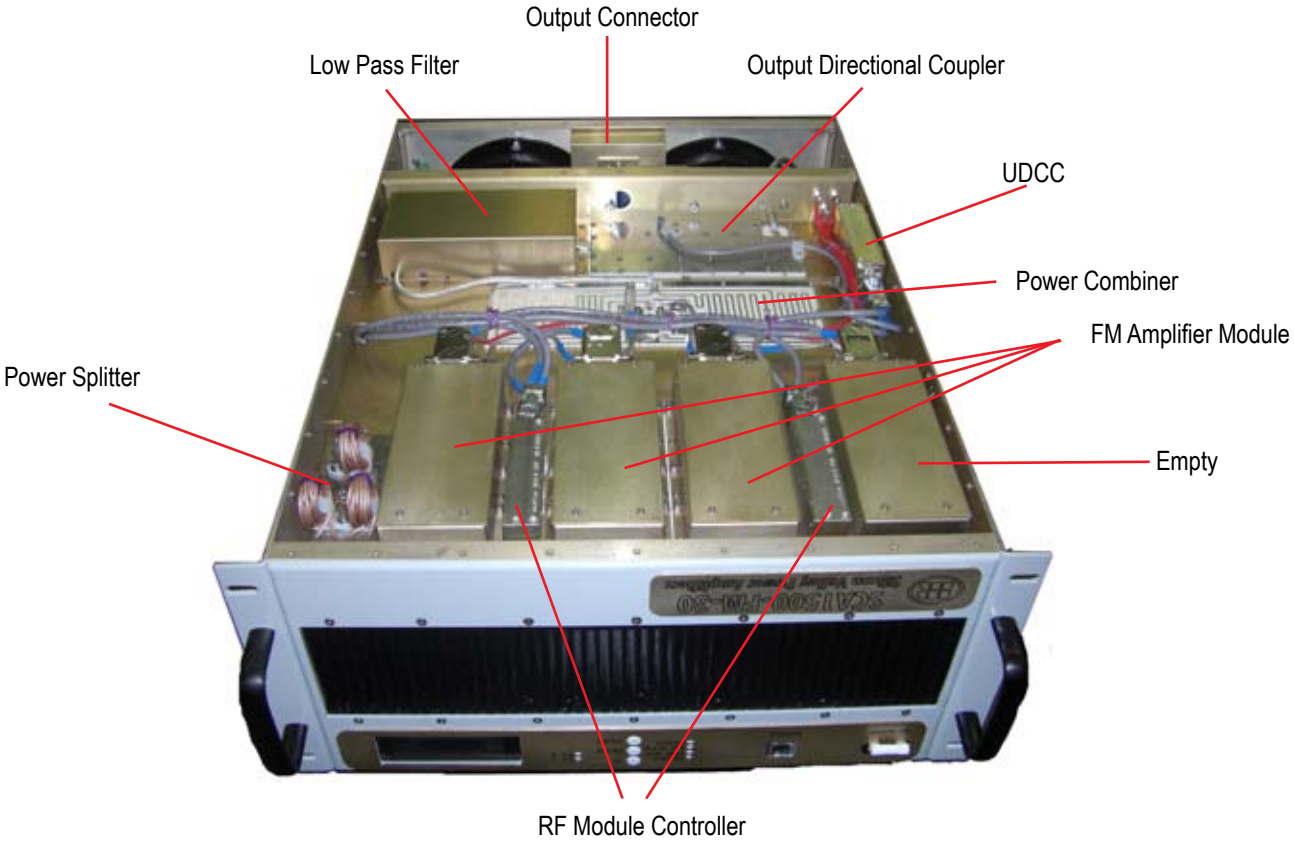
J2: Interlock	
J2 - 1	Interlock, Ground to enable
J2 - 2	Ground
J3: Relay	
J3 - 1	Normally Closed
J3 - 2	Common
J3 - 3	Normally Open
J4: Auxillary	
J4 - 1	Voltage PS-1, 1V/10V, nom 2.65V
J4 - 2	Voltage PS-2, 1V/10V, nom 2.65V
J4 - 3	Current PS-1, 1V/20A
J4 - 4	Current PS-2, 1V/20A
J4 - 5	OPTION, User Selectable
J4 - 6	Ground
J4 - 7	TTL: 3dB down (1/2 power)
J4 - 8	TTL: Power Out Down, 10W Increment
J4 - 9	TTL: Power Out Up, 10W Increment
J4 - 10	TTL: Amplifier Disable
J4 - 11	TTL: Amplifier Enable
J3 - 12	TTL: FAULT output

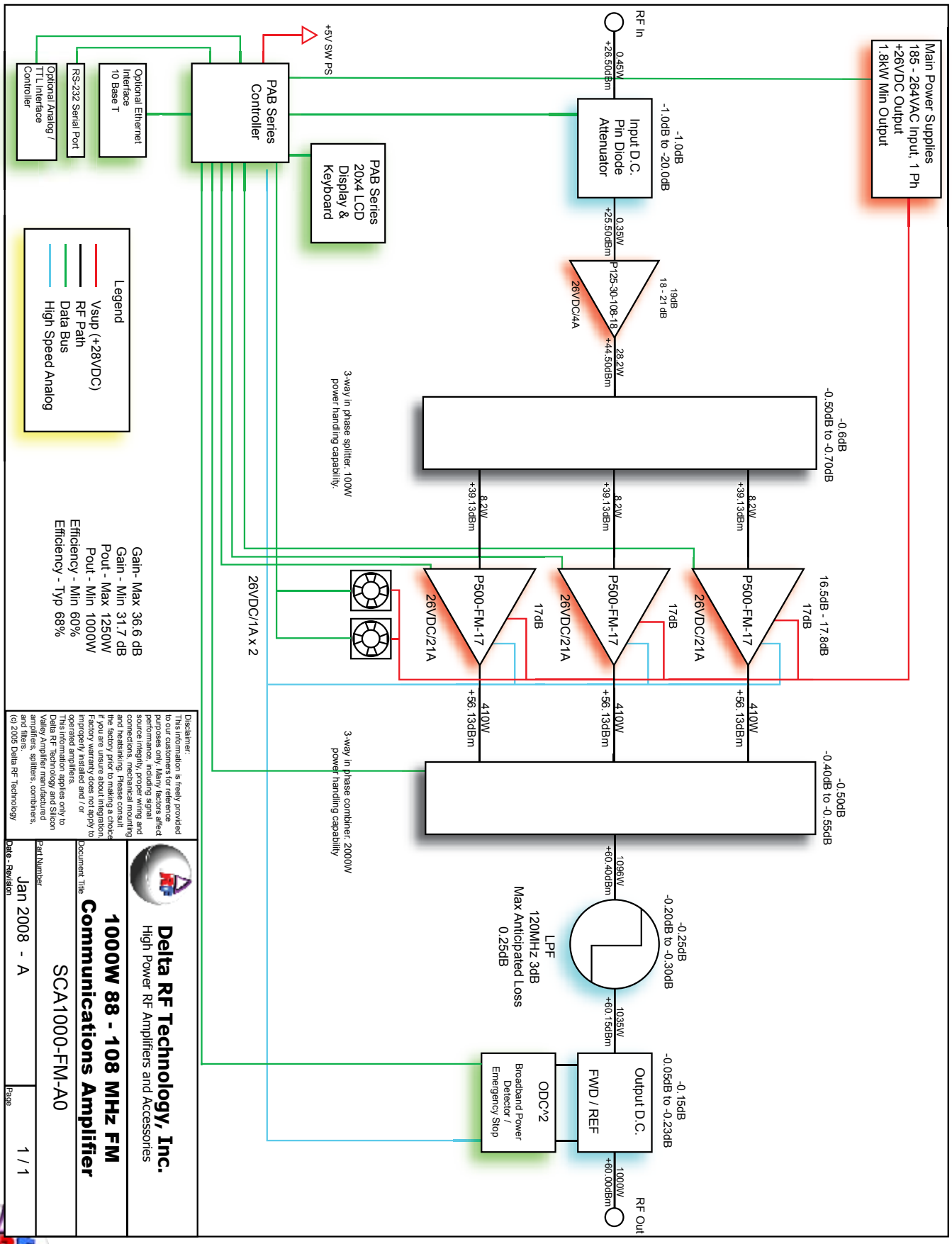


Top View



Bottom View




Main Power Supplies
185 - 264VAC Input, 1 Ph
+26VDC Output
1.8kW Min Output
RF In
0.45W
+26.50dBm
Input D.C.
Pin Diode
Attenuator
-1.0dB
-1.0dB to -20.0dB
0.35W
+25.50dBm
P125-30-108-18
26VDC/4A
19dB
18 - 21 dB
28.2W
+44.50dBm
-0.6dB
-0.50dB to -0.70dB
3-way in phase splitter. 100W
power handling capability.
+39.13dBm
8.2W
P500-FM-17
26VDC/21A
17dB
16.5dB - 17.8dB
410W
+56.13dBm
-0.50dB
-0.40dB to -0.55dB
3-way in phase combiner. 2000W
power handling capability
1096W
+60.40dBm
LPF
120MHz 3dB
Max Anticipated Loss
0.25dB
-0.25dB
-0.20dB to -0.30dB
1035W
+60.15dBm
Output D.C.
FWD / REF
ODC^2
Broadband Power
Detector /
Emergency Stop
-0.15dB
-0.05dB to -0.23dB
1000W
+60.00dBm
RF Out
PAB Series
Controller
+5V SW PS
Optional Ethernet
Interface
10 Base T
RS-232 Serial Port
Optional Analog /
TTL Interface
Controller
PAB Series
20x4 LCD
Display &
Keyboard
26VDC/1A x 2
Legend
Vsup (+28VDC)
RF Path
Data Bus
High Speed Analog
Gain- Max 36.6 dB
Gain - Min 31.7 dB
Pout - Max 1250W
Pout - Min 1000W
Efficiency - Min 60%
Efficiency - Typ 68%
Disclaimer:
This information is freely provided
to our customers for reference
purposes only. Many factors affect
performance, including signal
source integrity, proper wiring and
connections, mechanical mounting
and heatsinking. Please consult
the factory prior to making a choice
if you are unsure about integration.
Factory warranty does not apply to
improperly installed and / or
operated amplifiers.
This information applies only to
Delta RF Technology and Silicon
Valley Amplifier manufactured
amplifiers, splitters, combiners,
and filters.
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High Power RF Amplifiers and Accessories
1000W 88 - 108 MHz FM
Communications Amplifier
Document Title
SCA1000-FM-A0
Part Number
Jan 2008 - A
Date - Revision
Page
1 / 1

Amplifier Functional Description:
The SCA amplifier series is designed to deliver power at all costs. The power will be reduced if necessary to keep amplifier on the air. All functions and errors are logged and may be monitored from the amplifier or remotely.

High Temperature at Pallet Amplifiers or Combiner
Within 20° of maximum operating temperature, reduce output power to halt increasing temperature. Once temperature decreases below threshold, return power to set level. If temperature exceeds maximum, disable RF amplifiers, attempt restart at 30 second intervals or immediately upon temperature reduction

High VSWR:
Slowly reduce output power to keep VSWR under limits, up to 5:1. At 5:1, disable amplifier (requires operator intervention). If hardware trip is reached as in the evnet of a catastrophic failure, power is automatically reduced 3dB and operator intervention is required.

Low Exciter Input:
Increase RF Amplifier Gain to reach desired power. If RF input is still insufficient, signal alert, but keep amplifier operational.

High Exciter Input:
Decrease RF Amplifier Gain to maintain desired power. If RF input is still too high, disable amplifier. (requires operator intervention)

Dead Pallet Amplifier:
Reduce maximum output power to safe level, alert operator, keep amplifier operational.

Fan failure (total) or blocked airflow:
Within 20° of maximum operating temperature, slowly reduce output power to halt increasing temperature. Once temperature decreases below threshold, return power to set level.
If temperature exceeds maximum, disable RF amplifiers, attempt restart at 30 second intervals or immediately upon temperature reduction.

10 Failed password attempts through remote port:
Disable remote functions, requires front panel operator intervention.

AC Power Fail
Amplifier will automatically restart and provide RF within 10 seconds of AC restoration, unless UPS option is selected in which case RF power will remain as long as UPS has power. The amplifier can be user programmed to stay off in the event of power failure.

Power supply voltage out of range:
Reduce power to preset level for safe pallet operation at new voltage. Disable and restart power supply to attempt to clear fault.

PAB Controller Description:
The PAB series controller is a microntroller based system that uses embedded local controllers to monitor all amplifier functions and operations.
The system is designed to keep the amplifier on the air and offer complete status reports and self diagnosis.

How do I control the amplifier?
Two methods - through the front panel and through the RS232 or optional ethernet interface.
The front panel interface includes a 20 character x 4 line display, and front panel mounted push button keys. All amplifier parameters can be reviewed and set and all status events can be reviewed. The front panel interface also includes a remote lockout so the amplifier can not be accidentally powered when under maintenance or repair. When the amplifier enable button is in 'OFF' mode, the amplifier will not turn on even if power is requested.
The remote interface, whether RS-232 serial or optional ethernet interface, offer complete amplifier control and may be operated simultaneously with the front panel interface. Even if RF is inhibited through front panel interface, or the Remote Lockout is activated, the remote interface will still provide status information and also provide status of the safety switches.

What can I set on the amplifier?
- RF Enable - RF Power may be turned on and off.
- Power Level - Output power may be set. Depending on user mode selected, output power may be set in Watts, or as % of total power, or in steps using the analog rear panel interface.
- Power Fail Mode - Control whether the amplifier re-enables or goes directly to standby mode after an AC Power Failure.
- Directional Coupler Calbration - may be set against a known good power meter.

What can I monitor on the amplifier?
- RF Power - including Forward Power, Reflected Power, Input Power
- Power Supply AC Voltage - Presence of acceptable AC Voltage
- Power Supply DC Output Voltage- Voltage of power supply is monitored both at the output of the power supply and locally at the RF amplifiers
- Power Supply DC Current - Power supply current is monitored at each RF pallet amplifier.
- Temperature - temperature of every RF pallet amplifier, heatsink, combiner
- Fans - fan operation - both predictive and full stall

What self tests are performed?
Upon every startup, power supply function, individual RF pallet amplifier function, processor and embedded controllers, combiner are all checked.
During normal operation, Pallet Amplifier Operation, Power Supply Operation, Combiner, External Connections are constantly monitored. The controller will provide troubleshooting to the module level and can identify faults with the following modules: RF Pallet Amplifier, Driver, Power Supply, Combiner, Input Module.

What is displayed on the front panel of the amplifier?
6 LED's show amplifier status. All green, amplifier is enabled and operational. LED's show status of Amplifier, Fans, Power Supply, Driver, RF Pallet Amplifiers. LCD Display is used for monitoring and data entry:
Expert Mode: Power output Watts, Reflected Power Watts, Input Power Watts, Uptime days, hours, minutes. User can also choose scrollable display which includes every parameter monitored by the amplifier.
User Mode: RF Power Out - % total power, amplifier Status (OK / ALERT)

Can the amplifier operate in a damaged state?
RF Pallet amplifier damaged - the amplifier contains four pallet amplifiers and will provide output power even if up to three amplifiers are non operational.
Fan failure - amplifier power will be reduced to keep operation within safe levels. Even if temperature eventually exceeds absolute maximum ratings, amplifier will automatically re-enable when temperature falls below threshold.

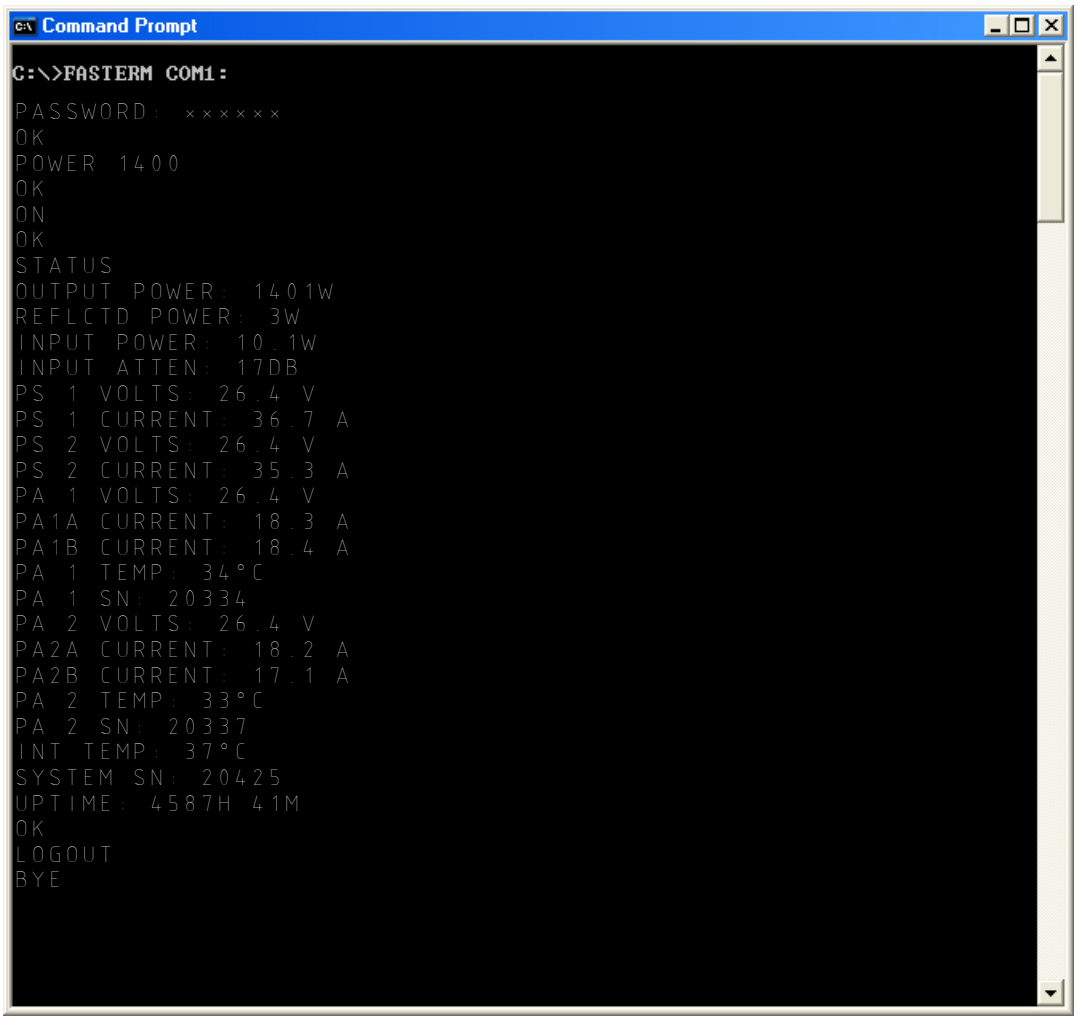
What security protections are included?
Front panel security includes optional system password and user passwords. User password can be used to enter detailed amplifier functions but not allow changies to output power. The same passwords are required for remote operation but add a failed password attempt lockout that must be cleared through the front panel. Expert / User modes are set from the front panel only and require the system password.

PAB Series Controller, Continued

Remote Control Functions:

- ON - Enables Amplifier when in REMOTE mode. If amplifier is in LOCAL mode, this function will give an error.
- OFF - Disables Amplifier, and resets error condition
- STATUS - Displays complete amplifier and module status, including power levels, voltages, currents, temperatures
- LOG - lists last log entry
- LOG xx - lists xx log entries, up to 1000
- LOGOUT - If password function is enabled through front panel, logs user out of the controller.

Sample Remote Control Communications Session:



Ordering Information:

Order Code	Description	DRFT Reference
SCA1000-FM-A0	1.0kW Broadband Self Contained Amplifier with LPF and PS For use with 5 - 25W Exciter Power	5143
SCA1000-FM-A1	1.0kW Broadband Self Contained Amplifier with LPF, and PS High Gain Option for 1W - 10W exciters	5144
Configuration		
-A11	Substitute SMA Female RF Input Connector [N Female is standard]	0201
-A17	Substitute BNC Female RF Input Connector [N Female is standard]	0207
-A25	Substitute 7/16 DIN Female Output RF Connector [7/8 EIA Flange Female Connector Standard]	0215
-A35	Substitute N Female Output RF Connector [7/8 EIA Flange Female Connector Standard]	0225
Options		
-A19	Ethernet Communications (replaces RS-232)	0209
-A24	Add Drawer Slides	0214
-A34	Add Rear Panel Monitor Port, -50dB	0224
-A26	UPS and Batteries for One Hour Operation, full power, Four hour operation, reduced power	0216
-A31	Phone / voice interface Autodial with problem report and amplifier identification.	0221
-A36	Install Second Power Supply for SCA1000-FM (redundant)	0226
-A37	External 1U Power supply rack, hot swap capability	0227
-T2	Extended Burn In	0271
-T3	Extended Data Collection	0272
-S	Ethernet Based Software Monitoring Program, Windows XP/Vista	xxxx

Testing Options:
Standard - includes power test and brief burn - in under laboratory conditions. Printed test report gives graph of Gain and Input Return Loss at rated P1dB and Voltage Conditions. Report shows pass/fail critera. All amplifiers include this test.
Extended burn in - 8-hour burn in at P1dB with standard test run at completion. Unit is monitored during test and any discrepancy reported. Standard test data is included.
Extended data collection - Standard data is run and included. Detailed data is taken point by point giving the customer 25 - 70 frequency points, depending on the amplifier model. For each frequency point, data is generated to include gain, input power, input return loss, current, second harmonic, third harmonic, efficiency, audio distortion.
Other tests available - Vibration, Temp cycling, Shock. Please inquire.

Warranty Statement:
All transmitters and optional accessories will be covered against manufacturer's defects, defects in construction, for a period of two years from date of shipment. Transmitter failures due to overdrive, overtemperature operation, excessive VSWR, improper operation, acts of God are not covered under this warranty. Warranty repairs will be performed on complete amplifiers or amplifier systems. Repairs will be granted on component level only after authorization by the factory. Exception: Main Power Supplies, including UPS option, are covered under their manufacturer's separate warranty.
All shipping charges are the responsibility of the customer. This is an abbreviated warranty statement. Please consult the factory for complete details.