CPI ModuMAX GaN SSPA Systems

Ku-Band

Designed to meet the most critical link applications, using GaN-based amplifiers to offer output power up to 1100 watts in Ku-Band

Leveraging patented technology and field-proven architecture, the ModuMAX SSPAs are completely modular and utilize passive combining of eight truly hot-swappable, plug-in RF modules as well as power supplies and other hot-swappable electronic assemblies to maximize performance and minimize downtime.

Designed for ease-of-use, with embedded secure web page and state-of-the-art technology, operators can keep in touch with performance indicators on a real-time basis via remote monitoring. For over 15 years, ModuMAX systems have been the preferred choice of broadcasters, telecommunication services, and teleports worldwide that require 100 percent uptime.

CPI ModuMAX GaN SSPA series:
high power, fully redundant, patented technology

Plug and play hot-swappable design maximizes performance and minimizes downtime

Mean Time to Repair (MTTR) of less than 3 minutes for field-serviceable components

Automated prime power saving and link recovery software

Easy-to-use touch screen for local control

FEATURES:

- Real-time virtual factory support
- Multiple redundancy features available
- 3-Year all-inclusive warranty
- Embedded web interface, with remote monitoring
- Remote software upgrade, and factory monitoring and assistance capabilities

POWER AND FREQUENCIES:

- **Ku-Band**
  1100 watts

Easy to Operate and Maintain

- Front panel color touch screen offers quick and easy access for onsite operational control
- Full remote control of all features via the standard network and RS-232/-422/-485 interfaces
- Fast and easy servicing via modular, hot-swappable components
- No downtime during module replacement

Parallel Architecture

- Hot-swappable major system components (power supplies RF modules, fans, logic board, parallel I/O board, front panel touch screen) enable continuous uptime
- RF and power supply modules readily accessible from the front of the chassis for easy maintenance
- Power supply modules configured in parallel to share load making the ModuMAX SSPAs extremely reliable and fault-tolerant
- Passive RF combining architecture provides robust design with no single point of failure allowing the system to stay online during a module replacement
- RF modules are combined in an efficient, waveguide power combining network, enabling multi-power level, self redundant configurations
- Front accessible modules eliminate cumbersome back-of-chassis cabling problems

Auto Recovery

- Failure of an RF module causes a drop of only 1.2 dB input power until the auto recovery software selects and enables an in-chassis spare module, or increases the gain of the remaining on-line RF modules
- Unlike conventional, switched redundant systems, there is no interruption of the uplink
- Defective modules can be hot-swapped while the SSPA continues to operate

RF Plug-In Modules

- 8 identical and fully interchangeable RF plug-in modules
- GaN technology provides improved reliability and higher linear output power compared to GaAs technology
- Module status is indicated via the touch screen front panel as well as an LED on each module
- Software continuously monitors temperature, voltage and current performance and auto-corrects for changes associated with long-term component operation, enhancing performance while logging parameter changes
- Electrical interfaces for power and RF provided by blind-mate connectors located at the back of the RF plug-in modules

Modular Power Supply

- Powered by up to 8 identical 48-volt dc power supply modules that share the SSPA power load in a redundant "N+1" configuration
- Sufficient built-in margin ensures that the loss of a single module will not affect operations, and any module can be hot-swapped without interruption via front panel
- Distribution bus connected to the chassis via extremely safe, keyed, quick-connect, self securing connectors
- Automatic logging of operational parameters of the power supply modules such as temperature, current and voltage

Quality Management System - ISO 9001:2015

CE

Cooling System

- Integral forced-air cooling system with fault-tolerant redundancy minimizes RF plug-in module temperature rise, maintaining RF power capability and increasing operational lifetime
- Built-in margin tolerates the loss of one cooling fan
- Monitoring of fan performance and status via the control panel display and via the M&C interfaces
- Easily remove and replace fans in the air cooling system without taking the SSPA offline
- In the event of a fan failure, the SSPA will continue to operate until a replacement is installed
- Separate air cooling system rear panel air intakes and exhausts that can be ducted outdoors or into the room

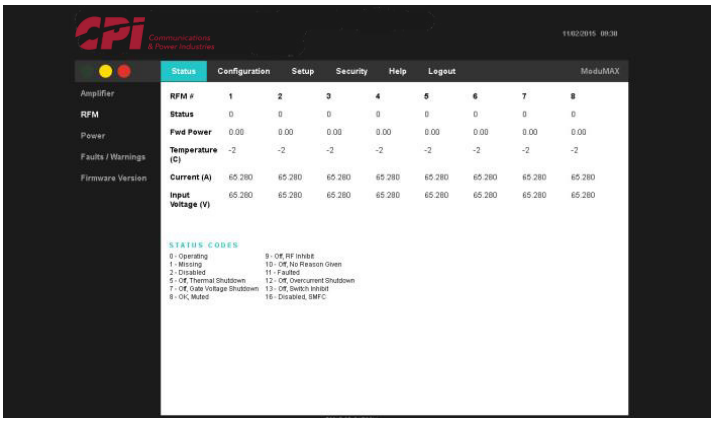
Sizing Your ModuMAX

Correct power sizing of the ModuMAX is critical for operational performance, ease of maintenance, and future expansion of additional carrier service. In addition to link budget power, inter-facility loss, and rain fade margin, the amplifier can be enhanced to leverage configurable power, fault recovery, as well as foreseeable additional service requirements. In addition, the ModuMAX can be phase combined with another ModuMAX to achieve higher power for additional multi-carrier operation.

.

User Interface—Leading Edge Software

The ModuMAX GaN SSPA is equipped with a color touch-screen for local control along with a leading-edge TCP/IP embedded Web interface. The software can be configured for remote monitoring and firmware upgrades, while allowing virtual factory access to monitor the amplifier system's key performance parameters such as temperature, current, and voltage measurements to individual component levels. The software provides a secure environment for systems management through the use of Simple Network Management Protocol version 3 (SNMPv3). SNMPv3 provides confidentiality through the use of packet encryption; message integrity to ensure that a packet has not been altered while in transit; and authentication that assures the received message originated from a valid source.



Sparing

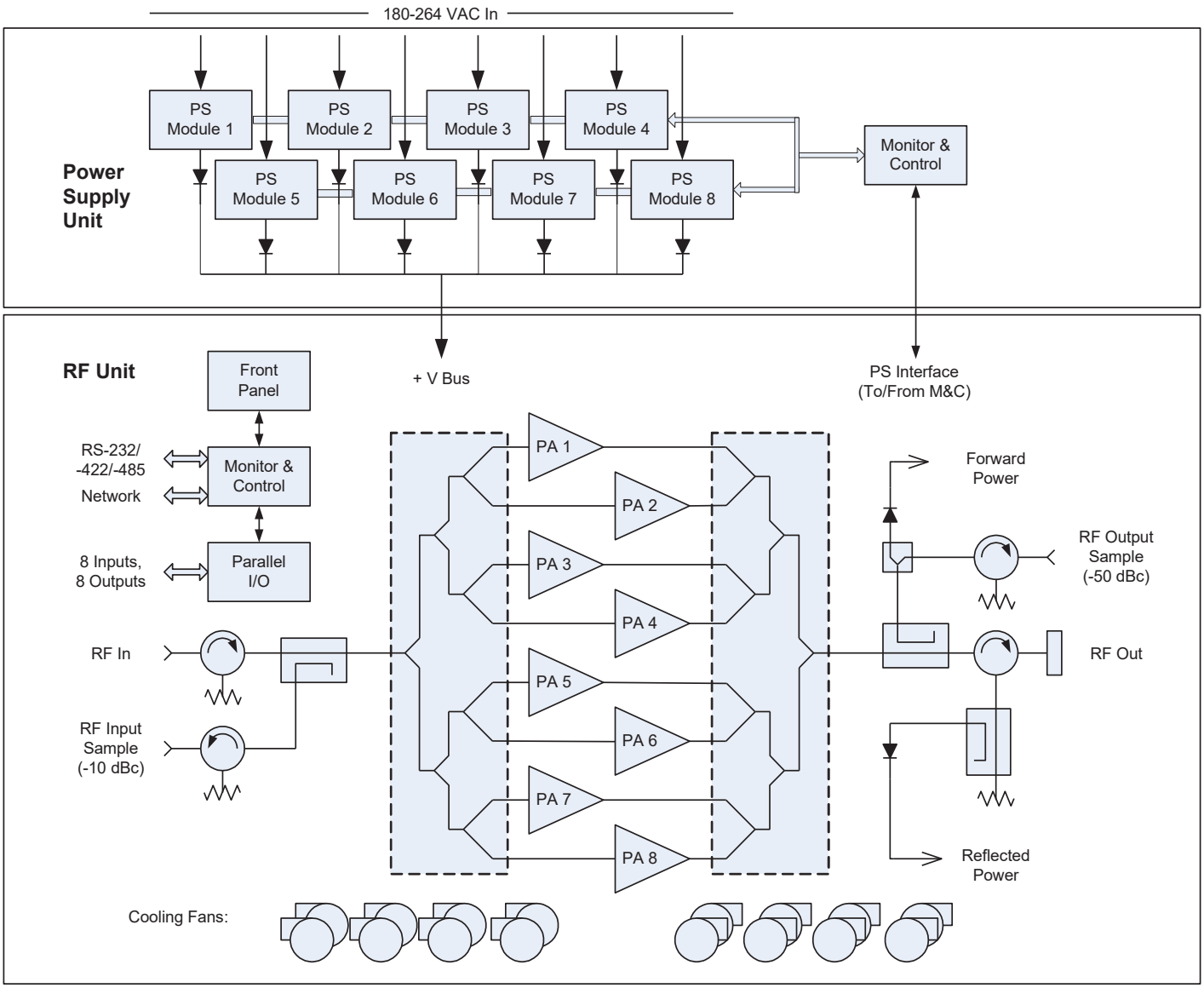
Sparing costs are minimized by utilizing a prudent spares kit capable of covering numerous systems. Spare RF modules offer an affordable alternative, since replacement is restricted to the module level. Spare modules can go from shelf to on-line in minutes.

Global EMC and Safety Compatibility

ModuMAX SSPA systems are certified to applicable EU EMI/EMC and safety standards.

Block Diagram

The block diagram below highlights the modularity and passive combining architecture which makes the ModuMAX the SSPA of choice. All active components within the design are hot-swappable without removal of power.



Parameter	Notes	Specification
Frequency Range	Ku-band, Extended	13.75 to 14.50 GHz
Gain, at Maximum Setting		60 dB min.
Gain vs. Temperature	0 to 50° C	±0.75 max., ±0.5 typical
Gain Adjustment Range	Digital	20 dB min. in 0.1 dB steps
Gain Flatness		±1.0 dB over the full band; ±0.3 dB over any 40 MHz
Saturated Power Output		+60.3 dBm typ. (1080 W)
Linear Output Power		+57.3 dBm min. (540 W)
Two Tone Intermodulation		-25 dBc max.,-30 dBc typical at rated linear power
Residual Noise, Ku-Band	14.0 – 14.5 GHz	-70 dBW/4 kHz max.
Group Delay	Linear Parabolic Ripple	0.03 ns/MHz 0.003 ns/MHz^2 1.0 ns peak to peak
AM/PM Conversion		1.0°/dB typical at rated linear power
Second Harmonic		-50 dBc max. at rated linear power
Spurious		-70 dBc max. at rated linear power
VSWR		1.3:1 max, input and output, 1.2:1 typical
Sample Ports	Input Output	-10 dBc typical -50 dBc typical
Power Requirements	Voltage Frequency Power factor	180 to 264 VAC 63 Hz max., 47 Hz min. .98 typical
Power Requirement	At rated linear power	11 kVA max., 7.4 kVA typical
Cooling System	Forced Air	RF Unit: requires airflow of 950 CFM [26.9 m³/min.] max. PS Unit: requires airflow of 160 CFM [4.53 m³/min.] max.
Operating Temperature	Ambient/Inlet air	0°C to +50°C
Storage Temperature	Non-operating	-45°C to +85°C
Relative Humidity		95% non-condensing
Altitude Derating	10,000 ft (3000 m) max.	Derate 2°C per 1000 ft (300 m)
Dimensions	RF Unit (16 RU panel height) Pwr Supply (4 RU Panel ht.)	19.0" W x 27.97"H x 29.37" D; 483 mm W x 711 mm H x 746 mm D (1) 19.0" W x 6.97" H x 27.46" D; 483 mm W x 177 mm H x 697 mm D (1)
Weight (2)	RF Unit Power Supply	388 lbs (175 kg) 103 lbs (46 kg)

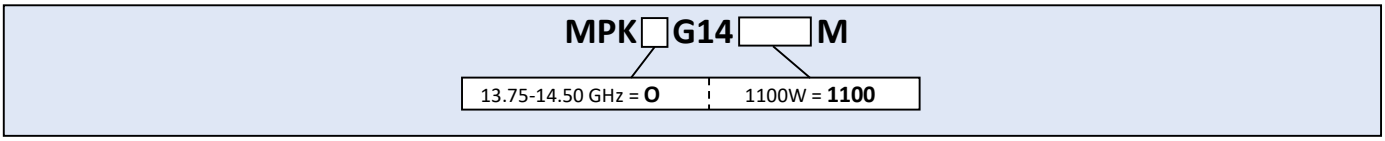
(1) From front cabinet rail to output waveguide (RF unit) or to AC (PS unit). See outline drawing for additional details.

(2) Size and weight are given for a single ModuMAX SSPA

Electrical Connections

RF Unit			PS Unit		
RF Input	N-Type (F), 50 ohms	J1	48V DC Out (PS1 - PS4)	SB350 (Blue)	J1
RF Output	WR75G, 4X Thru , 0.144"	J2	48V DC Out (PS5 – PS8)	SB350 (Blue)	J2
RF Monitor, Input	N-Type (F), 50 ohms	J11	PS Control	Micro-D, 9 Position (M)	P1
RF Monitor, Output	N-Type (F), 50 ohms	J13	AC Input, PCB	Terminals, 4 POS, 76A	TB1-TB4
Serial I/O	D-Sub, 9 Position (F)	J4	Ground	#10-32 Threads (M)	-
Parallel I/O	D-Sub, 37 Male (M)	J5			
Network	RJ-45, JACK (F)	J6			
System	D-Sub, 15 Position (M)	J7			
PS Interface	D-Sub, 9 Position (M)	J9			
USB	USB Type A (F)	J12			
48V DC Input (2)	SB350 (Blue)	J14,15			
Ground	#10-32 Threads (M)	-			

SSPA Part Number/Order Information



Each SSPA system includes an RF Unit, a Power Supply Unit or Units, interconnecting cables, mating connectors, rack slides, and mounting hardware. All features described in this specification are included as standard equipment.

Option Kits (Order separately):

- **45 RU Rack Cabinet (standard).** See also Rack Cabinet Integration Kits.
- **Rack Cabinet Integration Kits:** Includes cabling and waveguide needed to complete installation of one or two SSPAs into a standard 45 RU rack cabinet.

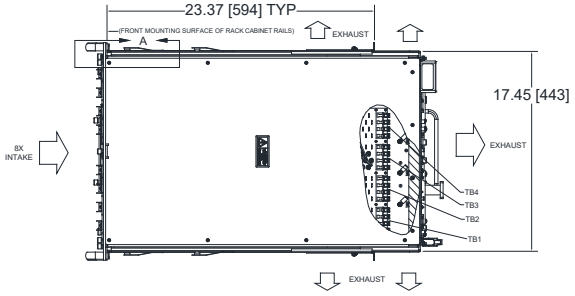
  Qty. 1 SSPA: Integrate (1) SSPA into a standard rack cabinet, with top-panel system interfaces for primary AC power, RF input, RF output, network, serial I/O, parallel I/O.

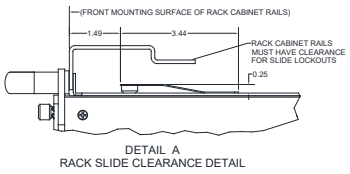
  Qty 2 SSPAs: Integrate (2) single-thread SSPAs into a standard rack cabinet with top-panel interfaces.
- **Spares Kit A:** Includes (1) RF Unit plug-in Module, (1) Power Supply plug-in Module, and (1) RF Unit Fan Assembly.
- **Spares Kit B:** Includes Spares Kit A plus (1) RF Unit Logic PCB, (1) Power Supply Capacitor PCB, (1) RF Unit Parallel I/O PCB, (1) RF Unit NIC PCB, (1) RF Unit Front Panel assembly, (2) RF Module Flexible Cable assemblies.
- **Maintenance Switch Kit:** Antenna/Dummy Load switch and high power RF termination for one SSPA.
- **Air Intake Duct Kit**: (2) Duct transition for one RF Unit chassis rear panel air inlets to (2) 6" diameter (152 mm) circular duct.
- **Air Exhaust Duct Kit:** (1) Duct transition for one RF Unit chassis rear panel outlet to (2) 6" diameter (152 mm) circular ducts.
- **Phase Combining Kit:** Variable phase combiner assembly and interconnection to (2) identical SSPAs to provide nominally twice the RF power output. (Both SSPAs must be installed in one rack cabinet; cabinet is not included in the Phase Combining Kit.)

  Combined system maximum saturated power:
  - 2200 W (2x 1100 W)

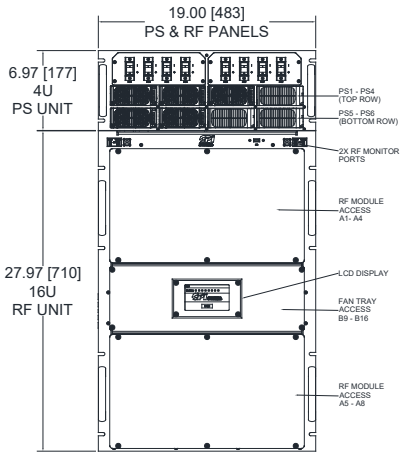
NOTES:

1. DIMENSIONS SHOWN IN INCHES [mm].
2. REFER TO DSPC-30555 FOR ADDITIONAL PRODUCT SPECIFICATIONS.
3. ESTIMATED MAX. WEIGHT:
   RF UNIT (8 MODULES): 388 LBS. [175 KG].
   PS UNIT (8 MODULES): 103 LBS. [46 KG]
   CABLES: 15 LBS. [7 KG]
4. ESTIMATED MAX. AIR FLOW & MAX. POWER DISSPATION (Psat):
   RF UNIT (8 MODULES): 950 CFM [26.9 m^3/min]; 23,500 BTU/HR [6.9 KW]
   PS UNIT (8 MODULES): 160 CFM [4.53 m^3/min]; 6,820 BTU/HR [2.0 KW]

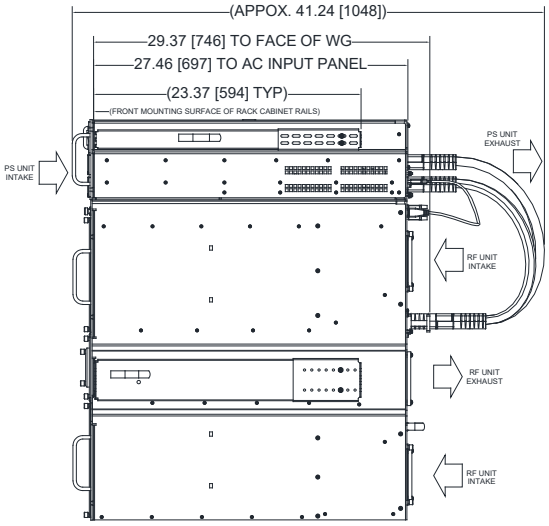




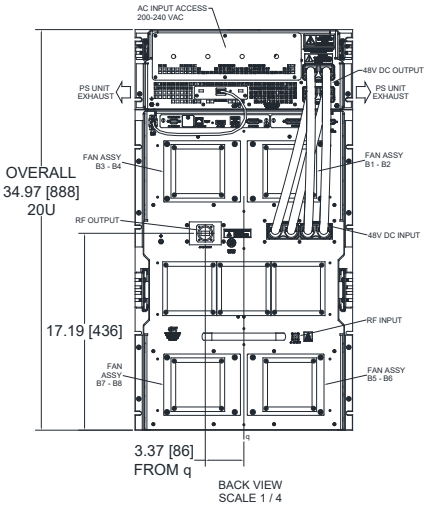
DETAIL A
RACK SLIDE CLEARANCE DETAIL



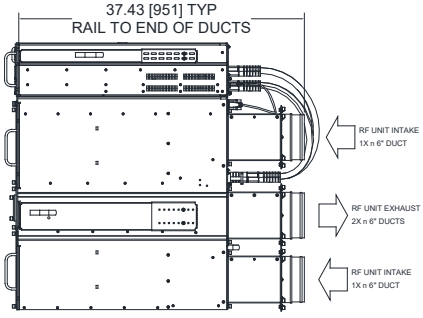
FRONT VIEW
SCALE 1 / 4



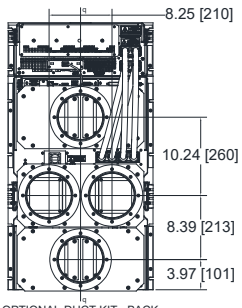
RIGHT SIDE VIEW
SCALE 1 / 4



BACK VIEW
SCALE 1 / 4



OPTIONAL DUCT KIT - RIGHT SIDE
SCALE 1 / 6



OPTIONAL DUCT KIT - BACK
SCALE 1 / 6

Communications & Power Industries

SMP Division
Satcom Products
tel: +1 (669) 275-2744
email: satcommarketing@cpii.com
web: www.cpii.com/satcom

For more detailed information, please refer to the corresponding CPI technical description if one has been published, or contact CPI. Specifications may change without notice as a result of additional data or product refinement. Please contact CPI before using this information for system design.