

GENERAL

Transmitter Type

Very Low Frequency Communications Transmitter

Power

RF Power Capability 120 kW

Adjustable from 25% to 100%

Configuration

Three power amplifier cabinets (one containing control) plus one matching cabinet. Each power amplifier cabinet contains 12 power amplifier modules each configured with 2 power amplifiers for a total of 72 power amplifiers in the system. Typically, 12 amplifiers are held in active reserve as 60 amplifiers can produce 120 kW under normal conditions. Each power amplifier is hot-pluggable and paired with a dedicated switched mode power supply.

Redundancy

The VLF transmitters offer the highest level of system redundancy to deliver maximum system availability. Redundancy features of the VLF120 include:

- 12 active reserve amplifiers (reserve capability may vary with RF load impedance)
- Fully redundant exciter and control logic
- Fully redundant external modulator inputs
- Dual/active reserve low voltage power supplies
- Each power amplifier is configured with its own switched mode prime power supply, for maximum redundancy and fault tolerance

On-air serviceable for the following lowest replaceable units (LRUs): Exciter and Control PWBs, RF Modules, and Power Supplies.

Power Amplifier

Each amplifier module includes two RF amplifiers. The amplifier is of the full bridge, Class D type with high thermal capacity MOSFETS in each leg. Maximum MOSFET junction temperatures are low for long life. The conservative power rating of 2kW per amplifier allows for rated power operation with high reactive and reflected power typical of narrow band low frequency antennas. Fully bi-directional operation allows for excellent linearity and power

efficiency. Fully static gate drive and control logic increases amplifier robustness under adverse conditions such as lightning or arcing.

Power Supplies

Each power amplifier rack includes 24 380 V AC-DC power supplies. Each power supply is directly connected to one power amplifier for maximum redundancy and fault tolerance.

Power Efficiency

AC to RF Efficiency > 82%

(Efficiency may be reduced when operating with high VSWR)

RF Frequency

21 to 30 kHz. Optional frequencies available down to 14 kHz

Optional automatic tuning capability

RF Output Connection

50 ohm 4 1/16" or to customer specifications

Emissions (system level performance)

ITU-R SM.328-10

ITU-R SM.329-12 / Category A (-60dBc from 9 kHz to 1 GHz)

RF Load VSWR

System will protect itself from damage during operation into any RF load

Rated Power delivered up to 5.0:1 VSWR

Exceeding limits results in graceful power reduction

Consult factory for specific VSWR requirements

Dual Exciters

The supplied dual DSP exciters may be operated with an external modulator or may be used for internal signal generation

Modulation Type

Pulse step envelope modulation

Modulation Capability

STANAG 5030 and STANAG 4724 with external modulator:

- Radio telegraphy (A1A)
- 50 Baud FSK
- 100 Baud MSK-2
- 200 Baud MSK-4

Consult factory for specific modulation requirements



AC INPUT

Voltage

380 V, 5-wire system TN-S

Voltage Variation 320 V AC to 456 V AC

Frequency Variation 47 Hz to 63 Hz

Nautel recommends the use of a suitably rated 3-phase 50/60 Hz isolation transformer with shield between primary and secondary windings

Other 3-phase configurations and voltages can be accommodated with a transformer

Power Consumption

150 kVA typical (Modulation scheme and load dependent)

Power Factor 0.97 typical

ENVIRONMENTAL

Operating Temperature Range

0°C to + 50°C

Derate 3°C per 500 m above sea level (2°C per 1,000 ft)

Humidity Range

0% to 95% non-condensing

Altitude

0 m to 3048 m (0 ft to 10,000 ft)

Cooling

Non-ducted, air-cooled

Waste Heat

28 kW (95,548 BTU/hr) typical (Modulation scheme and load dependent)

SAFETY

Compliant with EN60215:1996 Safety Requirements for Radio Transmitting Equipment

Optional International CSA Inspection

PHYSICAL

Maximum Dimensions

Power Amplifier Cabinet (x3)

120 cm D x 87 cm W x 229 cm H

Matching Cabinet

120 cm D x 250 cm W x 229 cm H

Maximum Overall Dimensions

120 cm D x 511 cm W x 229 cm H

Additional height required for RF connection on matching cabinet

CONTROL AND MONITORING

The VLF Series Local/Remote Interface provides the capability via RS-422 over the dual serial ports to configure, control, monitor and measure the critical parameters including but not limited to module level monitoring, RF Power, RF Current and RF Voltages, DC Voltages, Critical Temperatures and PA Cooling Fan Status. Fault and status reporting and diagnostic capability to Lowest Replaceable Unit (LRU) is also available via RS-422 over the dual serial ports.

RF Monitors at Transmitter

RF output current sample with BNC connector

MONITOR FAILURE THRESHOLDS

The changeover monitor detects RF-critical out of tolerance conditions and automatically transfers operation to the standby exciter, control and distribution stages with less than one second of signal interruption:

Exciter Failure

Exciter Not Responding

Rack Controller Failure

Reduction in output level

CUSTOMER INPUT/OUTPUT CONNECTIONS

Top and bottom cable entry

AC Input: Terminal Block in Control cabinet and each PA cabinet

Serial Connection: DB-9 in Control/PA cabinet

Station Reference Ground

RF Output Connection located at top of Matching Cabinet as standard

Carrier Frequency Reference Clock: BNC

External Modulator RF: BNC

OPTIONS

Custom designed antenna tuning and matching system

Antenna system modeling

NOTES

Specifications defined in a laboratory environment with high grade source and measurement equipment. Standard factory measurements do not include all items.