

## GENERAL

### Transmitter Type

Very Low Frequency Communications Transmitter

### Power

RF Power Capability 120 kW  
Adjustable from 25% to 100%

### Configuration

Three power amplifier racks plus one harmonic filter rack. Each power amplifier rack 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 RF Power Module is hot-pluggable and paired with a dedicated 5kW switched mode power supply.

### Redundancy

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

- 12 active reserve amplifiers (actual reserve capability may vary with RF load impedance)
- Fully redundant exciter and control logic including drive signals
- Dual/active reserve low voltage power supplies
- Each RF amplifier module configured with its own switched mode prime power supply.

On-air serviceable for the following LRUs: Exciter, Control, 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 dual 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 Efficiency

AC to RF Efficiency > 82%  
(Efficiency may be reduced when operating with high VSWR)

### RF Frequency

Available frequencies down to 18 kHz.

Carrier frequency remotely adjustable with automatic tuning within the supplied band.

Tuning time < 1 minute.

### RF Output Connection

50 ohm 3 1/8" or to customer specifications

### Emissions

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 53.33 kW RMS reflected (5.0:1 VSWR @ 120 kW) results in graceful power reduction

### 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

- Radio telegraphy (A1A)
- 50 Baud FSK
- 100 Baud MSK-2
- 200 Baud MSK-4
- STANAG 5030 and STANAG 4724 with external modulator

## AC INPUT

### Power Supplies

Each power amplifier rack includes 12 380 V three phase AC-DC power supplies. Each power supply is directly connected to one power amplifier module for maximum redundancy and fault tolerance.

### Voltage

3 N 380 V, TN-S

Voltage Variation 320 V AC to 476 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.

### Power Consumption

150 kVA typical

194 kVA maximum

Power Factor 0.98 or better



## 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)

### Waste Heat

28 kW (95,548 BTU/hr)

## SAFETY

Compliant with EN60215:1996 Safety Requirements for Radio Transmitting Equipment

## PHYSICAL

### Maximum Dimensions

Power Amplifier Cabinet (x3)  
120 cm D x 87 cm W x 229 cm H

Harmonic Filter 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 filter cabinet

### Weight

Power Amplifier Cabinet with modules installed:  
TBD

Harmonic Filter Cabinet:  
TBD

## CONTROL AND MONITORING

The VLF Series Local/Remote Interface provides the capability via SNMP over the dual Ethernet 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 reporting and diagnostic capability to Lowest Replaceable Unit (LRU) is also available via SNMP over the dual Ethernet ports.

### Metering

All critical parameters including DC and RF voltages and currents are available via SNMP via the dual Ethernet ports. These include but are not limited to:

**PA**  
DC Voltages  
Heat Sink Temperature

**Rack**  
DC Voltage levels

**Exciter**  
Combiner Current  
Combiner Voltage  
Combiner Power  
Output Voltage  
Output Power  
Output Phase

### Status

All critical system and module status are available via SNMP via the dual Ethernet ports. These include but are not limited to:

Status necessary to allow NL Series Diagnostics to Lowest Replaceable Unit (LRU)  
Transmitter Changeover Inhibit  
PA Module Inhibit  
Network A and B Status  
Exciter A and B Status  
RF Amplifier Status  
Power Supply Status  
Output Network Status  
External (RF Drive and Interlock)  
Exciter A or B Selected

Active Exciter A or B  
Output Network Tuning  
Firmware Upgrade Active  
RF On/Off

### Alarms

All system and module alarms are available via SNMP via the dual Ethernet ports. These include but are not limited to:

RF OverCurrent  
RF OverVoltage  
Lowest Replaceable Units (LRUs) Not Present  
LRU Failures  
LRU Internal Faults  
Low RF Output Current  
External Modulator Fault (RF Drive Fault)  
External Interlock Open  
Spark Gap Active  
High and Low Tuning Limits  
External Network Fault  
Changeover  
DC Voltage Failures

### Control

All control and configuration capability is available via SNMP via the dual Ethernet ports. These include but are not limited to:

RF On/Off  
Operating Frequency  
Operating Power Level  
Transmitter Changeover Inhibit  
Modulation Input Select  
Reset  
Select A or B Exciter

### RF Monitors at Transmitter

RF Output Current Probe with BNC Connector

## IP CONNECTIVITY

Dual Ethernet Ports (Side A and Side B) for control, monitor, configuration and diagnostic

### SNMP

SNMPv1 / SNMPv2c

## **MONITOR FAILURE THRESHOLDS**

The changeover monitor detects an out of tolerance condition that may result in a failure to properly produce RF output. The following out of tolerance conditions will initiate a transfer to the standby exciter/monitor, control and distribution stages resulting in a less than 1 second signal interruption:

- Exciter Watchdog Failure
- Exciter Not Responding
- Rack Controller Failure
- Reduction in output current

## **CUSTOMER INPUT/OUTPUT CONNECTIONS**

Top and bottom cable entry

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

Ethernet Connection: RJ45 in Control cabinet

Station Reference Ground: Mechanical Bolt

RF Output Connection located at top of Harmonic Filter Cabinet as standard

Transmitter Drive connection located in Control cabinet