

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 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

Carrier frequency remotely adjustable with automatic tuning within the supplied band

Tuning time < 1 minute.

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

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 reporting and diagnostic capability to Lowest Replaceable Unit (LRU) is also available via RS-422 over the dual serial ports.

Metering

All critical parameters including DC and RF voltages and currents are available via RS-422 via the dual serial 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 Current
Output Voltage
Output Power
Output Phase

Status

All critical system and module status are available via RS-422 via the dual serial 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
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 RS-422 via the dual serial ports. These include but are not limited to:

RF OverCurrent
RF OverVoltage
LRUs Not Present
LRU Failures
LRU Internal Faults
Low RF Output Current
External Modulator Fault (RF Drive Fault)
External Interlock Open
Spark Gap Active
Matching Network Fault
External Fault
Changeover
DC Voltage Failures

Control

All control and configuration capability is available via RS-422 via the dual serial ports. These include but are not limited to:

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

RF Monitors at Transmitter

RF Output Current Probe with BNC Connector

REMOTE CONNECTIVITY

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

RS-422

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 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
- RF Current Sample Port in Control Cabinet

OPTIONS

- Custom designed antenna tuning and matching system
- Antenna system modelling

NOTES

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