

## GENERAL

### Transmitter Type

Low Frequency Broadcast Transmitter

### Power

RF Power Capability 80 kW  
Adjustable from 0% to 100%

### Configuration

Two 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 48 power amplifiers in the system. Typically, 4 amplifiers are held in active reserve as 44 amplifiers can produce 80 kW under normal conditions. Each RF Power Module is hot-pluggable and paired with a dedicated 5 kW 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 LF80 include:

- 4 active reserve amplifiers (reserve capability may vary with RF load impedance)
- Fully redundant exciter and control logic including drive signals
- Fully redundant external modulators
- Dual/active reserve low voltage power supplies
- Each RF amplifier module configured with 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 2 kW 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 > 85%  
(Efficiency may be reduced when operating with high VSWR)

### RF Frequency

Available frequencies 30 - 150 kHz.

### RF Output Connection

50 ohm 3 1/8" or to customer specifications

### Harmonic and Spurious Emissions

Compliant with applicable ITU regulations and recommendations.

### RF Load VSWR

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

3200 reflected watts RMS (1.5:1 VSWR @ 80 kW) results in a 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

- A1B
- BPSK + DSSS
- Other CW modulation techniques limited to 2 kHz bandwidth

## 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 phase, 5 wire

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.

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

### Power Consumption

95 kW 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)

### Cooling Air Requirements

9,688 m<sup>3</sup>/hr (5,702 CFM)

### Waste Heat

15 kW (51,182 BTU/hr)

## SAFETY

Compliant with EN60215:1996 Safety Requirements for Radio Transmitting Equipment

## PHYSICAL

### Maximum Dimensions

Power Amplifier Cabinet (x2)  
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 424 cm W x 229 cm H

### Weight

Power Amplifier Cabinet with modules installed:  
500 kg (1100 lbs)

Harmonic Filter Cabinet:  
500 kg (1100 lbs)

(Weight and dimensions of harmonic filter cabinet may vary depending on frequency supplied)

## CONTROL AND MONITORING

The LF 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.

A direct-wired interface with isolated inputs and outputs is also provided for remote control and monitoring.

### 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:

- RF Power On/Off
- Status necessary to allow LF 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

### 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 Power On/Off
- Transmitter Changeover Inhibit
- Modulation Input Select
- Reset
- Select A or B Exciter

### RF Monitors at Transmitter

RF output Current Probe with BNC connectors

## 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

## MAINTENANCE

All components rated for 10 year life minimum over full environmental range.

2 year routine maintenance cycle which does not require off air.

## 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/PA cabinet and each PA cabinet

Station Reference Ground: Mechanical Bolt

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

Carrier Frequency Reference Clock

External Modulator

- RF
- Baseband (AES, I&Q)

Test Signal (AES, I&Q)

## 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.