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GENERAL

Transmitter Type
Low Frequency Communications Transmitter

Power
RF Power Capability 80 kW
Adjustable from 25% to 100%

Configuration
Two power amplifier cabinets plus one matching cabinet. 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 Amp is hot-pluggable and paired with a dedicated switched mode power supply.

Redundancy
The 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
- 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, 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 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 > 82%
(Efficiency may be reduced when operating with high VSWR)

RF Frequency
Available frequencies 30 - 160 kHz.
(Consult factory for specific requirements)

Optional automatic tuning capability

RF Output Connection
50 ohm 3 1/8" or to customer specifications

Emissions (system level performance)
ITU-R SM.328-10
ITU-R SM.329-12 / Category A (-60 dBc 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 (system configuration dependent)

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

STANAG 5065 with external modulator:

- 75 Baud FSK
- 300 Baud MSK

Consult factory for specific modulation requirements

AC INPUT

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.

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

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accomodated with a transformer

Power Consumption
100 kVA typical (Modulation scheme and load dependent)
Power Factor 0.97 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
Non-ducted, air-cooled

Waste Heat
20 kW (51,182 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 (x2)
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 424 cm W x 229 cm H

Additional height required for RF connection on matching cabinet

CONTROL AND MONITORING

The LF 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.

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 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:

RF Power On/Off
Status necessary to allow LF 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

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
Changeover
Matching Network Fault
External Fault
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 Power On/Off
Operating Frequency
Operating Power Level
Transmitter Changeover Inhibit
Modulation Mode
Reset
Select A or B Exciter

RF Monitor 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

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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/PA 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 modelling

NOTES

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