XR25/XR50

25 kW and 50 kW AM Medium Wave Broadcast Transmitters
The XR series is the fourth generation in an evolutionary process of design improvement that began in 1982, when Nautel introduced the world’s first solid state 10 kW to 50 kW AM transmitters. Over 20 million hours of real-world operational experience have gone into the design and construction of the XR series. The result is unparalleled performance and reliability.

The XR25 and XR50 are fully compatible with High Definition Radio (HD Radio™) and Digital Radio Mondiale (DRM), giving you a plug-and-play solution that simplifies your move into digital radio broadcasting.

Over-engineering gives the XR series not only impressive performance but also incredible reliability. The XR series’ load-sharing power modules (4 in the XR25 and 8 in the XR50) provide a transient-free fallback if a power module shuts down. The XR series stays on the air even if multiple power modules fail.

Modules are hot-pluggable, letting you service the transmitter without going off the air. For even greater on-air confidence, the XR series includes a complete standby DDS exciter and modulation encoder that automatically takes over when it detects a problem. The XR series even includes redundant cooling fans.

The XR series includes an intuitive control and monitoring system and an easy to read graphic interface, sophisticated alarms and a detailed logging system, making it easy to set up and monitor transmitter operations. You can program transmitter profiles, giving you one touch control of power, modulation and other key parameters. You can even program an operating schedule to comply automatically with daytime/nighttime power levels. The XR series also allows remote monitoring and control, letting you integrate it into your site control circuitry.

The high overall efficiency and low power consumption of XR series transmitters reduces your operating costs. Very low waste heat keeps ventilation simple and results in cool, reliable operation. And the XR series’ small footprint and lightweight frame reduces your shipping and site costs.

Whether opening a new facility or updating an existing one, discriminating broadcasters demand the performance, excellence and reliability of Nautel’s XR series AM transmitters.

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**Nautel XR25 & XR50 Quick Specs**

- Extra headroom for hybrid digital and full power AM
- 140% positive peak modulation at 25 kW for the XR25, and 50 kW for the XR50
- 1.5:1 VSWR at 25 kW for the XR25, and 50 kW for the XR50
- Load-sharing, hot-pluggable power modules
- Dual DDS exciters with automatic changeover
- Plug-and-play integration with Nautel’s NE IBOC AM HD Radio signal generator
- Programmable user interface facilitates custom profiles for each preset
- Built-in power preset scheduler allows for six preset power levels
- XR25/XR50 dimensions: 134.5 cm W x 184 cm H x 104 cm D

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POWERFUL BUILDING BLOCKS

The building block of the XR series is a power module integrating four modulator units and eight RF amplifier units with a combined output rating of 7.5 kW. These power modules plug into the front of the transmitter, making service easy.

The individual RF amplifier and modulator units are connected in the power modules using plug-in industry standard “D” connectors and bolted directly to the heat sink. Servicing consists of simple exchange, using only a screwdriver. Component level repair can be performed at the workbench or at a central service depot. These plug-in RF amplifier and modulator units are low cost, and can be economically replaced without the need for troubleshooting.

Ventilation is provided by redundant brushless DC-powered fans mounted in removable trays below the power modules. Airflow is unaffected by AC supply variations, ensuring cool operation and long term reliability.
ON-AIR SERVICEABILITY

XR series transmitters are ruggedly engineered to provide easy on-air service and maintenance. In the XR50, 64 amplifiers in 8 power modules combine to deliver 60 kW. In the XR25, 32 amplifiers in 4 power modules deliver 30 kW. At all power and modulation levels, all the modules contribute equally to the final output. If an amplifier fails, operation continues at a slightly reduced power. No stress is imposed on the remaining modules and spectral integrity is not compromised. Repair or replacement can be performed whenever it is convenient.

Nautel’s patented parallel network combiner offers important advantages over conventional series or balanced hybrid combiners. The technique is efficient and provides superior failure isolation. No damage to the combiner can be caused by failure of a module in either short or open circuit mode. A power module can be removed from the transmitter while the remaining modules continue to operate. This means that service may be performed during normal hours without a moment’s interruption in broadcasting.

AUTOMATIC STANDBY

The most critical part of a transmitter is the exciter section, which provides coherent drive to the power modules. These low level circuits generate the RF carrier and modulation control signals. A unique feature of Nautel transmitters is the complete duplication of these circuits. Should a failure occur in the RF drive or modulator drive, the transmitter automatically switches over to the built-in standby DDS exciter and modulation encoder. This dramatically enhances the already high operational reliability inherent in the modular solid-state design.

UNATTENDED OPERATION

XR series transmitters are built to stay on the air without human supervision. They maintain nominal output with 100% modulation even with an antenna mismatch of up to 1.5:1 VSWR. With more extreme VSWR, power is automatically reduced to a safe level. A unique circuit dynamically stabilizes power output against AC line voltage variations. After an AC power loss, over voltage or RF overload, prior operating status is automatically restored. The XR series is ideally suited for unattended automatic or remote controlled operation.

OPERATING CONVENIENCE

The XR series’ graphic user interface and soft-keys give you simple menu control of operating modes. Six power level selections are continuously adjustable over the full range using raise/lower commands. Programmable system profiles let you define schedules for changes to power and modulation settings. An LED diagnostic status flow diagram continually monitors the system, and an advanced control, alarm and 128 event time stamped logging system allows service personnel to easily identify problems.
EXTRA POWER

XR series transmitters are purposely designed for demanding AM broadcast applications that require reserve power. This extra power overcomes antenna system losses such as those encountered in complex directional arrays. It allows aggressive audio processing and high levels of asymmetrical modulation to produce more sideband energy and a stronger signal. Extra power also makes it possible to maintain full power AM transmission while also transmitting a digital signal or other simultaneous phase-coded data.

LOW COST OF OWNERSHIP

Very high efficiency and low maintenance overheads make this transmitter extremely cost effective to own and operate. Overall efficiency is typically 84% or better. This provides significant savings by reducing both total power consumption and the peak demand. The high efficiency means less energy is wasted as heat, which reduces cooling and ventilation costs. Redundancy features and protection systems maintain operation without reliance on an operator, reducing operating costs even further.

DIGITAL PERFORMANCE ADVANTAGES

XR series transmitters have been specifically designed to support the digital transmission formats now available and being developed for use on existing AM channels. The Nautel Interphase Pulse Duration Modulator employs an ultra linear extended band filter that maintains an envelope bandwidth of 40 kHz. A special circuit optimizes IPM to ensure minimal phase error. This provides a superior signal-to-noise ratio when transmitting a digitally encoded signal using digital modulation techniques such as HD Radio and DRM. The XR series’ digital performance is outstanding, even with the limited bandpass performance of real-world antenna systems. It is compatible with all digital modulation systems on the market. This combination of compatibility, performance and flexibility makes the XR series an ideal choice for digital broadcasters.
Nautel AM 12, 25 and 50 kW installed transmitters
GENERAL

Transmitter Type
Medium wave, 100% solid state

Configuration
Eight RF power modules each including eight broadband RF amplifiers and four modulator
Dual DDS exciters and modulation encoders. Full automatic changeover

RF Output Power
Maximum: 60 kW
Range: 10 kW to 60 kW
Six programmable preset power level profiles, selectable locally or remotely

RF Output Connection
3 1/8 inch EIA flange or to customer specifications

RF Output Impedance
50 ohms, unbalanced

Efficiency
84% typical

RF Load VSWR
8,000 peak reflected watts 1.5:1 VSWR at 50 kW, 100% modulation

Frequency Range
531 kHz to 1,610 kHz. Supplied, tuned and tested to one frequency as specified

Frequency Stability
± 2ppm over temperature range. External GPS for increased stability

Modulation Type
Nautel Wideband Interphase Pulse Duration Modulator

Modulation Capability
140% positive peak modulation at 50 kW
120% positive peak modulation at 60 kW

Spurious and Harmonic
Exceeds FCC, IC and ITU requirements
80 dB relative to carrier

AC INPUT

Voltage
188 V to 480 V, 3 phase, 50 Hz or 60 Hz to customer specifications

Power Supply Variation
±10% voltage, 47 Hz to 63 Hz

Power Consumption
59.9 kW typical at 50 kW, 0% modulation
89.3 kW typical at 50 kW, 100% modulation
71.4 kW typical at 60 kW, 0% modulation
107 kW typical at 60 kW, 100% modulation

Power Factor
0.95 typical

ENVIRONMENTAL

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 4,000 m (0 ft to 13,000 ft)

Cooling Air Requirements
3,200 CFM

PHYSICAL

Size
134.5 cm W x 184 cm H x 104 cm D
(53" W x 72.5" H x 41" D)

Weight
885 kg (1,950 lbs)

AUDIO PERFORMANCE

Audio Input
600 ohms balanced
+10 dBm nominal (adjustable from 0 dBm to +12 dBm)

Frequency Response
+0.2 dB/-0.8 dB, 30 Hz to 10,000 Hz.
Referenced at 1 kHz, 95% modulation
Total Harmonic Distortion  
Better than 0.8% (THD), 30 Hz to 10,000 Hz.  
Referenced at 1 kHz, 95% modulation

Intermodulation Distortion  
1.0% or less, 60/7000 Hz, 1:1 ratio  
SMPTE standards at 95% modulation.

Transient Intermodulation Distortion  
0.5% at 80% modulation, 2.96 kHz/8 kHz,  
30 kHz BW

Incidental Phase Modulation  
40 dB typical, 30 Hz to 10,000 Hz.  
Referenced at 1 kHz, 95% modulation

Square Wave Overshoot  
1.0% or less at 400 Hz (100 µS risetime)

Square Wave Tilt  
0.5% or less at 40 Hz

Carrier Shift  
0.5% or less

Hum and Noise  
-65 dB or better 12 kW, 100% modulation

Digital Compatibility

HD Radio™  
Compatible with NE IBOC - HD Radio signal generator  
Exceeds all regulatory requirements for AM HD Radio operation

DRM  
Compatible with 9 kHz mode of operation

Notes:  
Specifications defined in a laboratory environment with high grade source and demodulation equipment. Standard factory measurement does not include all items  
SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.