



NE50

50 WATT
FM 87.5 – 108.0 MHz



**DIGITAL
FM EXCITER**

Nautel Limited NE50 Digital FM Exciter

The NAUTEL NE50 is a broadband, fully digital 50 Watt FM exciter utilizing Direct Digital Synthesis (DDS) technology to generate the FM waveform. This produces a signal of exceptional spectral purity and audio fidelity which does not degrade over time.

The NE 50 makes possible an all-digital path from the studio to the FM modulator. Simple front panel frequency selection requires no tuning adjustment and audio performance is not affected by channel selection. The broadband solid state amplifier is capable of up to 55 Watts with adjustable output to 1 Watt. The NE50, which is illustrated in the block diagram, provides numerous benefits and advantages for today's FM Broadcaster.

Direct Digital Synthesis

DDS technology provides a 32-bit signal to digitally construct the carrier signal with a numerically controlled oscillator. Modulation in the digital domain provides a perfectly linear system. With DDS, low frequency modulation instability and signal degradation due to aging and microphonics are eliminated.

AES/EBU Digital Audio

AES/EBU digital audio may be input with a Digital Front End. Multiple RBDS or RDS/SCA inputs are also possible. Asynchronous reception of the AES/EBU signal allows automatic locking to any sample frequency between 25kHz and 55kHz.

Inputs include an XLR connector for electrically transmitted AES/EBU signals and a TOSLINK® optical interface for optically transmitted AES/EBU signals. There are also three BNC connectors for analog SCA signals.

A digital stereo generator is an integral part of the NE50 with a Digital Front End. An AES/EBU receiver demodulates the data stream and a sample rate converter re-synchronizes the audio samples to the exciter's internal timebase. A digital signal processor monitors, filters and interpolates the digital audio and generates a digital stereo composite signal, which is fed to the FM modulator. Digital stereo generation ensures linearity and superior performance over analog generators. A digital highpass filter eliminates any DC component in the digital data. Switches for on/off selection of pilot, stereo and SCA are provided, as well as for pre-emphasis settings of flat, 25, 50 or 75 microseconds.

The input data stream is continuously monitored for lock, parity and CRC errors. Alarm indication and output muting occur if a problem is detected. A 19 kHz pilot signal is output for RBDS operation.

In case the AES/EBU signal is interrupted, the existing unbalanced composite input port can be used as an analog input on an interim basis by either local or remote control.

Analog Audio

Analog audio may be input with the Analog Front End to the NE50 Exciter. Standard wideband composite (balanced and unbalanced), mono and SCA analog input signals are accepted. The analog inputs are summed, digitized, conditioned and fed to the DDS subsystem. NAUTEL's digital conversion technique utilizes high speed digital signal processing designed to ensure ultra low distortion and intermodulation products.

Field Upgradable to AES/EBU Digital

For stations currently utilizing analog technology, but anticipating a future upgrade to AES/EBU digital technology, the investment in an NE50 today is secure. An NE50 with an Analog Front End is convertible quickly and easily with a field upgrade kit to a Digital Front End that Accepts AES/EBU signals.

Upmixer and Filter

A unique upmix technique is used to translate the intermediate frequency FM signal generated by the DDS up to the desired channel in the broadcast band. Bandpass filtering ensures spectral purity while maintaining the DDS signal integrity.

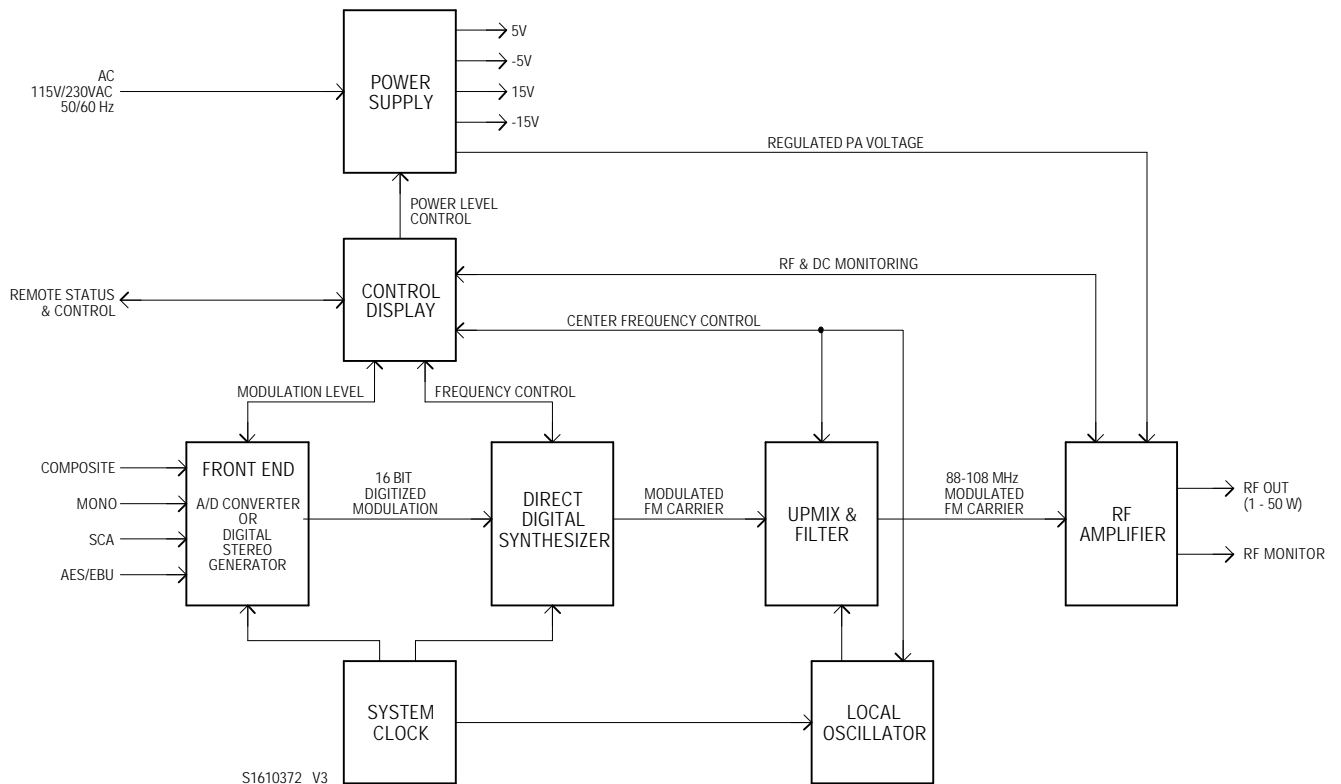
RF Amplifier

The RF amplifier is a 3-stage broadband amplifier capable of producing 1-55 Watts RF output. Rugged MOSFET's and a CATV broadband amplifier generate the RF power while maintaining signal integrity. An RF monitor permits modulation analysis.

BLOCK DIAGRAM OF NE50

(showing all the subsystems as described)

NE50 FUNCTIONAL BLOCK DIAGRAM



Front Panel Control/Display

The front panel is the control and diagnostic center for the exciter. Backlit numeric and text displays in conjunction with a four button control pad provide control/status information for easy operation.

Adjustable parameters available from the front panel include power level, center frequency, automatic level control (ALC) and drift setting which is a convenient fine adjustment of the center frequency (1Hz steps). Full metering is provided for voltage, current and power measurements. An alarm memory log stores up to 99 entries in reverse chronological order. Modulation percentage is displayed on a colour coded LED bar graph and BNC jacks are provided for composite input and output.

Low Power Transmitter

The NE50 may be utilized as a low power FM transmitter, when equipped with the optional harmonic filter. The RF output level is adjustable from 1-55 Watts.

DIRECT DIGITAL SYNTHESIS

- **32-bit signal processing**
- **Modulation in the digital domain**
- **Eliminates low frequency modulation instability and signal degradation**



Analog Upgradeable to Digital

The NE50 is available with a digital front end or any analog front end. Broadcasters utilizing analog systems today can still take advantage of the enhanced performance of the NE50's digital technology. The exciter is available with an analog front end for use with standard composite input and is field upgradeable to a digital front end quickly and easily. An investment today in an NE50 is protected for the future.

THE NAUTEL NE50 DIGITAL EXCITER further enhances the performance advantage of solid state NAUTEL FM transmitters



Simply the best engineered transmitters

Upgrade an Existing FM Transmitter

The benefits of digital performance can be realized with a currently installed FM broadcast transmitter. Tube or solid state FM transmitter installations can be upgraded with the NAUTEL NE50 digital exciter. The NE50 replaces analog exciters with plug and play compatibility. The audio fidelity, reliability, performance and benefits of the latest digital technology can be implemented with ease.

INPUTS: DIGITAL OR ANALOG

- **AES/EBU Digital or Analog Input**
- **Analog field upgradeable to AES/EBU digital**
- **Investment protection for the future**
- **TOSLINK Optical digital input available**

NAUTEL Solid State FM Transmitters

The NE50 comes standard with FM transmitters from NAUTEL. NAUTEL FM transmitters are 100% solid state and are available from 4kW to 20kW. On-air serviceability and typical overall efficiency rating of 65% are some of the key benefits of owning a NAUTEL FM transmitter. With an NE50 digital exciter and a solid state FM broadcast transmitter – both from NAUTEL – digital performance and cost-efficient operation can be realized.

Digital Performance

The NAUTEL NE50 is a fully digital FM exciter providing a signal that is spectrally pure and of exceptional audio fidelity. At the heart of the NE50 is a Direct Digital Synthesizer (DDS) which offers superior performance. The signal generated in the digital domain eliminates low frequency modulation instability. With this all-digital exciter, the signal does not degrade over time as in analog designs. The result is a reliable, high quality audio signal that is maintained over time.

AES/EBU digital audio may be input to the NE50 with a digital front end. Both electrical and optical connections are available. The optical connector is a TOSLINK type and offer the advantage of EMI isolation. In emergency situations when the AES/EBU signal is interrupted, and analog input capability is provided as a backup.

For further information, please contact us at:

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NE50 Specifications

GENERAL:

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| Power Output Range: | 1 to 55 watts, adjustable by front panel controls |
| Frequency Range: | 87 to 108MHz, digitally programmable in 10kHz steps by front panel controls |
| Fine Frequency Range (Drift Adjust): | ± 9999Hz, digitally programmed in 1Hz steps by front panel controls |
| RF Output Impedance: | 50 ohms, BNC jack; VSWR protected |
| RF Output Monitor: | -30dBc, BNC jack |
| RF Harmonic and Spurious Suppression: | Meets or exceeds all FCC, DOC and ISC requirements and CCIR recommendations for a 55 watt transmitter when used with optional low pass filter |
| Frequency Stability: | ±250Hz, 0°C to 50°C ambient temperature range |
| Modulation Type: | Direct Digital Synthesis using a 32 bit NCO (numerically controlled oscillator) |
| Display: | Backlit 4½ digit and 32 character displays for control, monitor and status. Alarm log holds up to 99 entries in reverse chronological order |
| Modulation Capability: | 150% (±75kHz reference standard) |
| Modulation Indication: | Colour coded LED bargraph indicating total modulation depth in 5% increments |
| Asynchronous AM S/N Ratio: | 75dB minimum below reference carrier with 100% amplitude modulation using 75µs de-emphasis (no FM modulation present) |
| Synchronous AM S/N Ratio: | 60dB below reference carrier with 100% amplitude modulation at 400Hz with 75µs de-emphasis |

ELECTRICAL AND MECHANICAL:

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| AC Input Power: | 120 or 240 VAC ±10%, 50/60Hz, 260 watts typical at 50W output |
| Dimensions: | 5.25 inches (13.34 cm) H x 19 inches (48.26 cm) W x 20 inches (50.8 cm) D, slide-out mounting rails included |
| Mounting: | Standard 19" (48.3 cm) EIA rack mountable |
| Weight: | 40lbs (18kg) |

OPERATING ENVIRONMENT:

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| Temperature Range: | 0°C to 50°C |
| Relative Humidity: | To 95%, non-condensing |
| Altitude: | To 13,000 feet (4,000 meters). Derate 2°C/1,000 feet, 3°C/500m |

STEREO PERFORMANCE WITH DIGITAL INPUT MODULE

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| Input Connector: | Two total; one XLR female, one optical input receiver |
| XLR Input Impedance: | 110 ohms, nominal |
| Input Level: | -4.0dB full scale reference, factory programmed |
| Data Format: | AES/EBU (reference standards; AES5-1984, ANSI S4.28-1984, AES3-1985, ANSI S4.40-1992 and AES3-1992) |
| Data Rate: | Any in range 25kHz to 55kHz (32, 44.1 or 48kHz typically) |
| Digital Stereo Generator: | The digital input module generates the composite stereo baseband signal from the left and right digital audio present in the AES/EBU data |
| Pre-Emphasis: | 0, 25, 50 or 75µs, locally selectable |
| Pilot Carrier: | 19kHz ±0.1Hz. 9% injection level, factory programmed. Locally selectable on or off. Available on rear panel BNC jack, as TTL or 1vpp sine for RBDS operation. |
| 38kHz Suppression: | 80dB below ±75Hz deviation reference |
| Stereo Separation: | Better than 60dB, 30Hz to 15kHz |
| Amplitude Response (L or R): | ±0.2dB, 30Hz to 15kHz, referenced to 0dB at 400Hz |
| FM Signal to Noise Ratio (L or R): | 80dB below 100% modulation (Reference 400Hz, measured in a 22Hz to 22kHz bandwidth with 75µs de-emphasis and DIN 'A' weighting) |
| Stereo Total Harmonic Distortion (L or R): | 0.025% or less, 30Hz to 15kHz, measured in 22Hz to 22kHz bandwidth with 75µs de-emphasis |
| Intermodulation Distortion (L or R): | CCIF: 0.008% or less (14/15kHz 1:1); SMPTE: 0.025% or less (60 and 7000Hz 1:1) |
| Transient Intermodulation Distortion (DIM) (L or R): | 0.05% or less (2.96kHz square wave/14kHz sine wave) |
| Stereophonic Crosstalk: | 60dB below 100% (30Hz-15kHz) modulation reference: L+R to L-R and L-R to L+R |
| Stereo/Monaural Mode Control: | Local control. Configures the digital audio receiver to accept both L and R (Channel A and B) in stereo mode or L only (Channel A) in monaural mode |
| Backup Analog Composite Mode: | Local/Remote control. Disables digital stereo generator and reconfigures digital input module to accept analog composite stereo on existing composite input connector located on rear panel. All SCA inputs remain valid. |

MONAURAL PERFORMANCE WITH DIGITAL INPUT MODULE

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| FM Signal to Noise Ratio: | 90dB below 100% modulation (Reference 400Hz at ± 75 kHz deviation with 75 μ s de-emphasis and DIN 'A' weighting in a 22Hz to 22kHz bandwidth) |
| Harmonic Distortion: | 0.005% or less 30Hz to 15kHz (22Hz to 22kHz bandwidth with 75 μ s de-emphasis) |

WIDEBAND COMPOSITE OPERATION WITH ANALOG INPUT MODULE

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| Inputs: | One balanced (floating BNC jack), one unbalanced (BNC jack), one unbalanced front panel test input (BNC jack) |
| Input Impedance: | Balanced - 10 k/50 ohm selectable Unbalanced - 10 k ohm |
| Input Level: | 3.5V p-p nominal for ± 75 kHz deviation |
| Amplitude Response: | ± 0.05 dB 30Hz to 53kHz |
| FM Signal to Noise Ratio: | 90dB below 100% modulation (Reference 400Hz at ± 75 kHz deviation with 75 μ s de-emphasis and DIN 'A' weighting 20Hz to 80kHz bandwidth) |
| Harmonic Distortion: | 0.005% or less at 400Hz measured in a 22Hz to 80kHz bandwidth with 75 μ s de-emphasis |
| CCIF Intermodulation Distortion: | 0.009% or less (15kHz/14kHz 1:1 ratio) |
| SMPTE Intermodulation Distortion: | 0.015% or less (60Hz/7kHz 1:1 ratio) |
| Transient Intermodulation Distortion: | 0.015% or less (2.96kHz square wave/14kHz sine wave) |
| Composite Phase Response: | $\pm 0.5^\circ$ from linear phase 30Hz to 53kHz |
| Stereo Separation: | Better than 50dB, 30Hz to 15kHz when measured in conjunction with a high quality stereo generator and demodulator |

MONAURAL PERFORMANCE WITH ANALOG INPUT MODULE

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| Input Impedance: | 600 ohms balanced, resistive, transformerless |
| Input Level: | +10 dBm nominal for ± 75 kHz deviation at 400Hz (adjustable) |
| Frequency Response: | ± 0.5 dB (30Hz to 15kHz) selectable flat, 25, 50, or 75 μ s pre-emphasis |
| FM Signal to Noise Ratio: | 90dB below 100% modulation (Reference 400Hz at ± 75 kHz deviation with 75 μ s de-emphasis and DIN 'A' weighting in a 22Hz to 22kHz bandwidth) |

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| Harmonic Distortion: | 0.005% or less at 400Hz measured in a 22Hz to 22kHz bandwidth with 75 μ s de-emphasis |
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| CCIF Intermodulation Distortion: | 0.009% or less (15kHz/14kHz 1:1 ratio) |
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| SMPTE Intermodulation Distortion: | 0.015% or less (60Hz/7kHz 1:1 ratio) |
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| Transient Intermodulation Distortion: | 0.015% or less (2.96kHz square wave/14kHz sine wave) |
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SCA (RBDS/RDS) PERFORMANCE

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| Inputs: | 3 Unbalanced (BNC jack) |
| Input Impedance: | 10 k ohm |
| Input Level: | 2.8V p-p nominal for ± 7.5 kHz deviation |
| Amplitude Response: | ± 0.5 dB 20kHz to 100kHz |
| Subcarrier Frequency Range: | 57kHz to 92kHz (25kHz to 92kHz monaural) |

ANALOG BACKUP OPERATION WITH DIGITAL INPUT MODULE

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| Input Connector: | One unbalanced (BNC jack) |
| Input Impedance: | 10K ohm |
| Input Level: | 3.5V p-p nominal for ± 75 kHz deviation |
| Amplitude Response: | ± 0.2 dB, 30Hz to 53kHz |
| FM Signal to Noise Ratio: | 85dB below 100% modulation (Reference 400Hz at ± 75 kHz deviation with 75 μ s de-emphasis and DIN 'A' weighting 20Hz to 80kHz bandwidth) |
| Harmonic Distortion (plus noise): | 0.02% or less, 30Hz to 53kHz, measured in 22Hz to 80kHz bandwidth with 75 μ s de-emphasis |
| Stereo Separation: | Better than 38dB, 20Hz to 15kHz when measured in conjunction with a high quality stereo generator and demodulator. |

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| CCIF Intermodulation Distortion: | 0.009% or less (15kHz/14kHz 1:1 Ratio) |
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| SMPTE Intermodulation Distortion: | 0.02% or less (60Hz/7kHz 1:1 ratio) |
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| Transient Intermodulation Distortion: | 0.015% or less (2.96kHz square wave/14kHz sine wave) |
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