The Model 380 represents Inovonics' fourth generation of self-contained Magnetic Recording Electronics for professional audio recording applications. The 380 is suitable either for new OEM installations or for substantially improving the performance of existing magnetic tape and film recording equipment. Features include:

- Equalization, level and bias adjustments for routine, two-speed, operation, and a third, "optimiser" operating mode with separate adjustments to accommodate a different tape stock, operating level, track format, EQ characteristic, etc.

- "Pickup" (insert) Record Capability with adjustable delay, and "Sync" reproduce with automatic monitor transfer.

- Provision for remote selection of monitor function, and defeatable "Auto Mute" to attenuate playback during high speed search.

- Adjustable circuitry to reduce the effects of tape compression and phase distortions.

- Increased erase, bias and signal headroom for high coercivity tapes.

- Switchable "VU" or " ips, quasi-peak program monitoring.

- Two or more units easily interconnected for stereo or multi-track installations.

**Frequency Response (in Hz):**

<table>
<thead>
<tr>
<th>30ips</th>
<th>15ips</th>
<th>7ips</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVERALL</td>
<td>± 1dB, 46-35kHz</td>
<td>± 1dB, 50-20kHz</td>
</tr>
<tr>
<td>SYNC</td>
<td>REPRODUCE</td>
<td>± 1dB, 46-35kHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>± 1dB, 50-20kHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>± 1dB, 50-10kHz</td>
</tr>
</tbody>
</table>

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**Model 370 Tape Recorder Electronics**

The Inovonics 370 is a replacement electronics package for updating older professional recorders. It is a basic, two-speed, no-frills unit with excellent performance, high reliability and rugged construction to meet the demands of continuous use in broadcast, studio and educational applications.

The 370 accommodates virtually any combination of original and replacement heads of either high or low impedance. It is pin-compatible with Ampex 300, 350, and 440-series machines and easily adapted to most other professional recorders. Features include:

- All controls are "up front" for easy setup, calibration adjustments are stable, multi-turn pots.

- Entire electronics assembly unplugs from the front for ease in servicing, all components are standard, "off-the-shelf" available parts.

- Two units plug together for stereo operation.

**Overall Frequency Response (in Hz):**

<table>
<thead>
<tr>
<th>35</th>
<th>15</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVERALL</td>
<td>± 2dB, 25-25kHz</td>
<td>± 2dB, 20-15kHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>± 2dB, 10-8kHz</td>
</tr>
</tbody>
</table>

---

**Signal-to-Noise Ratio** (in dB, referred to a "peak" record level 6dB above 250mV/m; 20Hz-20kHz; 2:1 or multi-track format):

<table>
<thead>
<tr>
<th>OVERALL</th>
<th>STANDBY</th>
</tr>
</thead>
<tbody>
<tr>
<td>30ips</td>
<td>uWtd.</td>
</tr>
<tr>
<td>15ips</td>
<td>-65</td>
</tr>
<tr>
<td>7ips</td>
<td>-64</td>
</tr>
</tbody>
</table>

**Recorded Distortion (THD at 15-mil-wavelength bias peak, 15ips):**

<table>
<thead>
<tr>
<th>Operating Level</th>
<th>HIGH SPEED</th>
<th>OPTIMIZED MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>30dB above Op Level</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>60dB above Op Level</td>
<td>50%</td>
<td>40%</td>
</tr>
<tr>
<td>90dB above Op Level</td>
<td>95%</td>
<td>70%</td>
</tr>
</tbody>
</table>

**Line Input:** Electronically-balanced, bridging accepts nominal line levels between +10 and +10dBm in CALIB position of INPUT GAIN control. Control affords additional ±10dB gain range.

**Line Output:** Balanced, transformer-isolated, provision for balanced, transformerless operation. May be adjusted for nominal line levels between +4 and +10dBm. Clipping Level, +12dBm into 600-Ohm load, +30dBm into bridging inputs.

**Power Requirements:** 105-130VAC (230V available), 50/60Hz, 0.3A (plus transport)
**MODEL GHM-00, GHM-01 HEADROOM METER**

The Gordon Headroom Meter is a peak-reading audio level indicator conforming to the UK/EBU standard (BS4997:1966) for response to audio program peaks. The device responds to the UK/EBU specification, indicator ballistics has been optimized for a more artistic display than the conventional PPM.

The Gordon Headroom Meter is available in two versions. The GHM-00 is a complete metering system including both an electronics assembly and an optimum meter movement with expanded-range scale. The GHM-01 is a retrofit electronics kit for adapting existing "VU" meters. Any number of meters in a given installation can be simultaneously switched into a "lineup" mode by a single contact closure. In the case of the GHM-00, gain is increased by a preset amount for ease in system calibration with steady-state test tones, the GHM-01 is returned to true "VU" operation. Similarly, another single contact closure imparts a 75-microsecond pre-emphasis characteristic to all connected meters. This provides more meaningful measurements in disc transfer and FM broadcasting.

**Input Impedance:** 180k, balanced, 90k, unbalanced.

**Input Sensitivity:** Accepts nominal line levels between 0dBm and +10dBm. An alternate single-ended input can be used with levels down to -20dBm.

**Frequency Response:** ±0.5dB, 20Hz-20kHz. Phase response is linear.

**Peak Response:** Quasi-peak, per UK/EBU, 10ms. integration characteristic (BS4997:1966).

**Peak Response Accuracy:** GHM-00, ±0.5dB; GHM-01, ±1dB for "VU" meters which meet ANSI C16.5-1954.

**Power Requirement:** ±15VDC bipolar, regulated; 16mA per meter.

**Meter Size (GHM-00):** Nominal 3½-inch (3.5" x 3.0"), surface- or bezel-mountable.

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**MODEL 201 AVERAGE AND PEAK RESPONDING LIMITER**

Inovonics' Model 201 is an unusually smooth dual-function audio limiter designed for studio recording, mastering, and broadcast production work. Serving as both a fast peak limiter and independent average-responding limiter, Model 201 restricts program peaks to a preset ceiling value while maintaining the average program level within desired limits. Features include variable dynamic range compression, exclusive open-loop gain reduction and ripple-canceling circuitry, and visual indication of gain reduction.

**Frequency Response:** ±0.5dB, 20Hz-20kHz.

**Signal-to-Noise Ratio:** >75dB, 20Hz-90kHz referred to +4dBm.

**Distortion (THD):**
- Peak Limiter
  - Slow Release: <0.5%
  - Fast Release: <1.0%
  - Average Level Limiter: <0.5%
- 50Hz-200Hz
- 200Hz-20kHz

-<0.5%
-<0.5%
-<0.5%

**Limiter Timing:**
- Peak Limiter
  - Attack: Continuously variable between 1µs/dB limiting and 1ms/dB limiting.
  - Release: Continuously variable between 5ms/dB limiting and 50ms/dB limiting.
- Average Level Limiter
  - AVG Response: 10ms/dB limiting
  - "VU" Response: 30ms/dB limiting

**Input:**
- Sensitivity: Adjusts to accommodate input levels between -15 and +5 VU with calibrated "unity gain" position.
- Impedance: 100k, unbalanced (transformer optional).

**Output:**
- Transformer-isolated line output feeds 600 ohm line or bridging inputs at +4 or +8dBm. Clipping level +94dBm.

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**MODEL 241 "DYNEX" NOISE SUPPRESSION**

A program-controlled filter/expander, Model 241 DYNEX is an effective tool for suppression of residual background noise in audio reproduction systems, TV film chains, etc. Model 241 offers a choice of operating modes for selective suppression of low-frequency, high-frequency, or wideband noise, or restoration of program dynamics by linear expansion.

**Frequency Response:** ±0.5dB, 50Hz-90kHz

**Signal-to-Noise Ratio:** Output noise below -85dBm

-<0.1% THD up to +8dBm
-<0.3% THD up to +23dBm

**Noise Suppression Characteristics:**
- Choice of LF roll-off, HF roll-off or broadband suppression. Restoration to flat response begins when energy in the suppressed band exceeds threshold.

**Linear Expand:** 10dB of broadband program attenuation with linear re-expansion to unity gain beginning at threshold.

**Input:** 100k unbalanced bridging (transformer optional) for nominal line levels between 0 and +8dBm.

**Output:** Transformer-isolated line output feeds 600 ohm line or bridging inputs at nominal line levels. Clipping level +94dBm.
The Inovonics 215 offers an "as needed" approach to audio processing for AM and FM broadcasting. Processing options are provided in the form of plug-in subassemblies to perform gain-riding A.G.C., average level compression and peak control functions. The various options are available singly or in pairs to fulfill a specific processing requirement or to complement existing equipment. "Fully-loaded," the 215 stands alone as a complete broadcast audio processing chain.

Gated A.G.C. Amplifier (-01 option):
Capture Range: ± 10dB
Correction Rate: 0.5dB/second
Pink Noise Source: Pseudo-random digital Pink Noise may be substituted for program for set-up or test.

Average Level Compressor (-02 option):
Compression Ratio: Program-variable, approximately 9:1 at 10dB compression.
Stereo Interconnection: Compressors are slaved when two units are interconnected.

AM Peak Controller (-03 option):
Phase-Follower: Inaudible "phase rotation" circuit to maintain maximum positive modulation.
Peak Controller: Integrated feedback-limiter/clipper circuit with adjustable clipping depth.
Asymmetry: Positive peaks continuously variable to +150%.

FM Peak Controller (-04 option):
Selective Limiting Characteristics: Selectable "flat" or 75/25µs complementary pre-limiting pre-emphasis and post-limiting de-emphasis.
Peak Controller: Integrated feedback-limiter/clipper circuit with adjustable clipping depth.
Frequency Response: ± 1dB, 50Hz-15kHz
Distortion: <0.3% above 200Hz, approx. 1% at 50Hz.
Noise: Better than 60dB below 100% modulation.
Input: Balanced, –30 to +10dBm
Output: Balanced, 0 to +20dBm, +24dBm clipping level.

The Inovonics 231 is a user-oriented discriminate processor of advanced design to assure optimum modulation in AM broadcast applications.

The MAP-II includes a slow, "gain-riding", gated A.G.C. to erase input program level variation. The eight bandpass compressors offer control over the input and the output signal in each, to afford ultimate "dynamic equalization" of the program material.

The unique Peak Controller incorporates a true, fast peak limiter with a clipper in a feedback arrangement to give total control over clipping depth and asymmetry. Maximum positive modulation is assured by an inaudible phase "rotation" circuit, rather than the usual phase switching schemes.

A built-in Pink Noise generator aids in system setup.

All component parts are readily available, "off the shelf", and circuit assemblies are accessible from the front of the unit for ease in servicing.
The Inovonics 377 is a self-contained, dual-channel magnetic tape reproduce amplifier. Designed primarily for broadcast automation systems, the 377 also finds use in background music installations, tape duplicator "QC" checkers and other basic, single-speed applications.

- Accommodates virtually any tape reproduce head: -01 option can be strapped for either Hi-Z or Lo-Z head windings. Pin-compatible with Ampex and Schafer equipment.
- Low noise design utilizes an optimum combination of IC and discrete circuitry for lowest residual electronics noise.
- Wide equalization adjustment range for both NAB and IEC recording characteristics, 1% to 30ips.
- Multi-turn trim adjustments and fully regulated power supply assure stability of settings and drift-free operation.
- Entire electronics amplifier subassembly unplugs from the front panel for ease of maintenance.

**Frequency Response** (in Hz):
- 15ips: ±2dB, 30-22k
- 71/2ips: ±2dB, 20-18k
- 31/4ips: ±3dB, 20-14k

**Output:** Transformer-isolated, feeds 600-ohm line or bridging inputs, balanced or unbalanced, at +4 or +8dBm for zero-VU.

**Signal-to-Noise Ratio** (STANDBY in dB; 2-track format):
- 15ips: -70
- 71/2ips: -70
- 31/4ips: -69

**Recommended Head Inductances:** -00 version—200mH to 1H, 400mH optimum. -01 version—same as -00 or strappable for 3 to 6mH, 4mH optimum.

**Power Requirements:** 105-130VAC (230V available), 50/60Hz; 1/4A (plus transport, if powered by 377).

**Model 405 “TENTROL” RECORDER CONSTANT TENSION ACCESSORY KIT**

Inovonics' Series 405 is an easily installed accessory kit which provides constant tape tension on most professional audio recorders and duplicator transports. The kit is designed to reduce capstan slippage, eliminate pitch change, extend head life, and improve high-frequency system performance.

Active in the "RECORD" and "REPRODUCE" modes, it may be used to control either the holdback or takeup tension. TENTROL does not disturb the tape path since it utilizes a tachometer which is attached to the reel motor.

TENTROL is designed for use with all Ampex 3-motor transports and is adaptable to many others.

- **Tape Widths:** 1" and under.
- **Tape Speeds:** Speed pairs from 33/4 - 71/2 ips to 60-190ips.
- **Reel Sizes:** "Cine" (17/4") hub through 14" with NAB hub.
- **Nominal Constant Tension at Head:** Adjustable from 3 to 9 ozs. within motor torque and heat dissipation limitations. Variation throughout reel ±1/2 oz.
- **Starting Torque:** Adjustable for optimum starting characteristics.
- **Maximum Torque Available:** 85% of rated maximum motor torque.
- **Power Requirements:** TENTROL receives power from the tape transports and will operate at 50 or 60 Hz.

Since 1972 Inovonics has been providing sophisticated audio recording, processing and instrumentation equipment for the professional broadcast, recording and sound-related industries.

Products designed and manufactured by Inovonics are distributed worldwide through professional audio and video equipment dealers. Contact your distributor, or Inovonics directly, for additional information, or a demonstration of any item.
MODEL 500 ACOUSTIC ANALYZER

Here's everything you need for one-third-octave sound-level and reverberation-time analyses. Inovonics' Model 500 Acoustic Analyzer. It's one very sophisticated but easy-to-use instrument. Lightweight but rugged, Model 500 goes wherever you go. From the freeway interchange to the auditorium, concert hall, and laboratory.

500 Features:
- Large, easy-to-read 13 x 31 LED matrix displays both real-time and reverberation decay plots.
- Filter rectifier time constants can be selected for peak or log-averaging readings in the real-time mode. Decay plot scanning rate may be set for integrating periods of 7.5, 15, 30, or 60 milliseconds-per-step.
- Digital readout indicates Reference Level in dB-SPL or dBA-SPL from 40 to 139, and in dBm from -60 to +39 for line input signals. RT<sub>60</sub> measurements to 10 seconds are displayed with 10 ms resolution.
- Analyzer sensitivity is manually programmable up and down in 1 dB steps.
- "Auto Level" function automatically programs analyzer sensitivity based on wideband level information.
- Dual, independent memories store or accumulate spectrum or decay plots.
- A rear-panel connector provides an external oscilloscope output and trigger for auxiliary bar-graph display. The digital I/O interface connector readies the Inovonics 500 for peripherals such as hard-copy printers or three-dimensional displays.
- An internal generator supplies wideband pink noise for real-time analysis or noise in octave bands for RT<sub>60</sub> measurements.
- The analyzer operates from either the AC line or its own internally charged battery.

Analyzer Sensitivity: (for 0 dB Reference Level) 40 to 139 dB-SPL or dBA-SPL, microphone; -60 to +39 dBm, line.
Display Range/Accuracy: 0.5, 1 or 2 dB/step with relative Reference Level and indicated display error less than ±0.95 dB; 3 dB/step with less than ±0.5 dB error.
Filter Characteristics: 2 pole-pair filters on ISO one-third-octave centers, 55 Hz to 50 kHz. Response exceeds ANSI S1.11/Class II 1971 standard. Relative filter accuracy ±0.5 dB.
Rectifier Characteristics: Peak or 0.25, 1 or 4 second log-averaging response.
Reverberation Analysis: RT<sub>60</sub> readout internally extrapolated from 30 or 15 dB initial decay. Measurements to 9.99 seconds with 10 ms resolution; Accuracy ±3%; ≤2 counts for decays greater than 0.1 second.
Microphone Input: 500 ohms, balanced with XLR connector.
Line Input: 100K-ohms, unbalanced; calibrated to ±0.5 dB.
Pink Noise Source: Digitally-synthesized, pseudo-random; ±0.5 dB spectral accuracy. Selectable wideband or octave-band output with 2-pole filters on ISO centers, 63 Hz to 8 kHz. Manually-gated, unbalanced output is variable to ±5 dBm.
External Oscilloscope Output: BNC connectors for 'scope vertical and sweep trigger; external 'scope display has 7.5, 15, 30 or 45 dB dynamic range.
Interface Connector: Permits external control of memory storage, pink noise gating and decay plot scan; provides display data output and internal clocking signals for interfacing with digital peripherals.
Power Requirement: 115/230 VAC, ±10%; 50/60 Hz; 25 watts.
Internal Battery: 3-hour typical operating life; recharges in 8 hours.

MODEL 153 X-Y RECORDER INTERFACE

The Inovonics 153000 Assembly provides interface between the Model 500 Acoustic Analyzer and an X-Y recorder so that hard-copy records can be made of real-time and reverber-time acoustic analyses. Digital data from the 500 is converted into step-function analog X and Y outputs to feed any plotter with 2 VDC full-scale sensitivity, such as the Hewlett-Packard 7015 B or UREI 900/9020. The Assembly conveniently mounts within the recess of the Model 500 back panel, and may remain installed without inconvenience.
A "CAL" button facilitates plotter setup, and a "PLOT" button initiates the transfer of display or memory data to paper. Data forms with coordinates and other pertinent information can be generated on any office copier from a master supplied with the 153000 Assembly.

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