Nakamichi
700ZXL / 700ZXE
Computing Cassette Deck
Auto Tuning Cassette Deck

Auto Cal
Bias
Level
EQ
Tape
FX
Equalizer (μsec)
70
Noise Reduction
DX

RAMM 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

0000

L - - - - - - - - - - - - -
dB-40 30 25 20 15 10 5 0 3 5 7 +10
R - - - - - - - - - - - - -

Pause Record Rewind F.Fwd Stop Play
⏸ ○ << >> □ >

Eject

Power Phones

RAMM
RAMM < > Set Reset

Auto Cal.
Azimuth Run

Counter
Reset

Monitor
Tape
Source

Tape Memory
Standby/Set A B C D

Manual Set
Eq/NR

Line Input
L ● R

In the seven years of its existence, the Nakamichi 700 has consistently been a best seller, preferred by the great number of musicians and performing artists who appreciated its unique combination of styling and performance. As worthy successors to the legendary 700, we have created two new cassette recorders — the 700ZXL and the 700ZXE — each designed in the 700 tradition of "external beauty that reflects internal precision" and each employing the most advanced concepts of modern technology.

The 700ZXL emulates the features and performance of the Nakamichi 1000ZXL — the world's most advanced cassette recorder. It utilizes two sophisticated microcomputers. One controls the A.B.L.E. system and automatically adjusts the four key recording parameters — Azimuth, Bias, Level, and Equalization — to obtain maximum performance from each tape. The second operates the RAMM (Random Access Music Memory) and provides automatic selection of up to 30 separate programs via a unique encoding technique.

700ZXL Computing Cassette Deck

Although the 700 ZXE is somewhat less sophisticated than the 700ZXL, the two are practically equivalent in performance and specifications. The 700ZXE automatically adjusts azimuth, bias, and level to match the recording tape and features a RAMM system capable of skipping from 1 to 9 programs to find the one you desire. Both recorders include Dolby-B noise reduction and accommodate the NR-100 Dolby-C processor as well as all current and future noise-reduction systems. The striking appearance of the 700ZXL and 700ZXE is due in

no small measure to the intelligent application of human engineering. Controls that are used infrequently are concealed behind a panel that flips up at a touch for ready access. Main controls are clustered neatly along the bottom. Key settings — such as choice of tape, equalization, and noise reduction, RAMM and Auto Calibration status — are indicated by illuminated legends that match the design of the electronic meters and tape counter.

Auto Tuning Cassette Deck **700ZXE**

700ZXL Computing Cassette Deck

Represents A New Dimension In Recording Accuracy And Operating Convenience With The A.B.L.E. Auto Calibration Processor And Encoding RAMM Capable Of Memorizing 30 Sequential Commands.

A.B.L.E.™ Auto Calibration Processor
(Azimuth, Bias, Level, Equalizer)

Automatically adjusts azimuth, bias, level, and equalizer to match the tape being used. Frequency response of 18-24,000 Hz ±3 dB shatters previously accepted limits.
Efforts to improve tape have produced a vast proliferation in formulations — each slightly different from the next vis a vis bias, sensitivity, and equalization. Furthermore, molding tolerances cause tape to follow a different path in each cassette. For optimum results with current and future tape, a deck must adjust bias, level, and equalization to the tape's specific characteristics. To correct for housing problems, record-head azimuth must be aligned to the path in that particular cassette. Performed manually, such procedures can be quite tedious.

The 700ZXL A.B.L.E. auto-calibration processor is a revolutionary system that quickly, accurately and *automatically* adjusts the recording parameters to suit each tape.
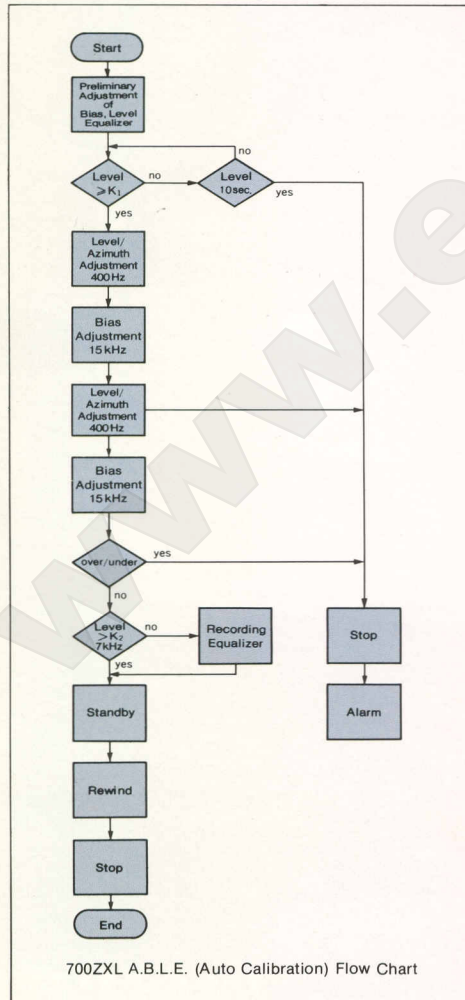
700ZXL A.B.L.E. (Auto Calibration) Flow Chart

Except for azimuth — which naturally should be aligned for each housing — the optimization data (including tape-selector, playback-equalizer, and noise-reduction setting) can be stored in one of four memories. When that tape brand is used again, data can be recalled and only azimuth readjusted.

A.B.L.E. operation is remarkably simple. After the tape selector and playback equalizer are set for the type of tape being used, calibration is initiated by placing the deck in RECORD/PAUSE and pressing PLAY and AUTO CAL RUN. As shown in the flow chart, first azimuth and recording level are adjusted based upon the output level and inter-channel phase difference of a 400-Hz recording. Next, 15-kHz is recorded, and bias is adjusted until the playback level matches that of the 400-Hz tone. Since bias affects sensitivity, the procedure is repeated to refine the settings. Finally, a 7-kHz tone is recorded and the equalizer tuned to flatten response.


During calibration, indicators flash for each step; after calibration, the display is stable, and the tape rewinds. Data can now be stored by pressing one of the four memory buttons. If tape characteristics are out of range, all legends flash a warning. After calibration, response is unusually smooth and extended — 18 to 24,000 Hz ±3 dB (20–20,000 Hz ±1.5 dB) — far beyond the capabilities of any conventional recorder.

RAMM
(Random Access Music Memory)

Secretely encodes up to 15 programs or program segments. Accepts 30 commands to retrieve selections in any order desired.
Unlike other program-selection systems that locate the beginning of a program by detecting a segment of unrecorded tape, the 700ZXL RAMM *encodes* each program during recording
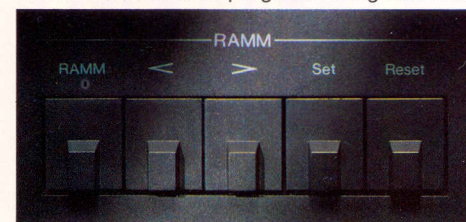
with a unique "address." In playback, the codes are deciphered, and selections are played in the order you have commanded.

Although the codes normally are recorded automatically in the blank section of tape between selections, manual encoding at *any* position — even *within* a program — also is possible. Fifteen unique codes are provided on each cassette side. You can program up to 30 playback commands so selections can be repeated as often as you wish. Since the code contains information regarding the equalization and noise reduction used when recording, it makes these selections automatically during playback so there is no need to set EQ and NR switches when playing a RAMM-encoded tape. The code consists of a subsonic 5±0.1 Hz signal recorded out of phase on the two channels and has no influence whatsoever on playback sound.

● Automatic Encoding — If the input disappears for 2 seconds, the RAMM detects the blank and records the next address code automatically. This feature is particularly convenient when recording a disc.

RAMM Coded Tape
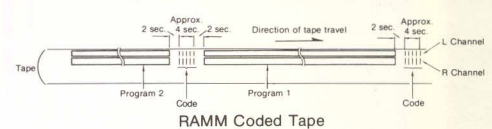
● Manual Encoding — The next address can be recorded at any time at the touch of a button to enable a particular *portion* of a program to be encoded. Manual encoding can be interspersed with automatic encoding as desired.

Remote Control

Control the 700ZXL — even program the RAMM — from the comfort of your easychair.
Transport commands — even RAMM instructions — can be issued remotely with the optional RM-300 Control Unit. The RM-300 has its own 4-digit tape counter so you know the exact tape position at all times. With the RM-200 unit, all transport commands (apart from RAMM operations) are remotely accessible.

700ZXL/700ZXE

The Same Superb Tape Transport Mechanism, Discrete Three-Head Technology, Double-NF Amplification, And Advanced Noise-Reduction Systems Are Featured On Both Decks.

Head Technology

Nakamichi's exclusive Discrete Three-Head Technology permits precision azimuth alignment and optimization of each structure.

Nakamichi conceived and developed Discrete 3-Head cassette recording. Only mechanically as well as magnetically independent heads can realize the full potential of the cassette, for only such a system can provide accurate magnetic azimuth alignment. In the 700ZXE and 700ZXL, azimuth alignment is performed automatically on each cassette you record.
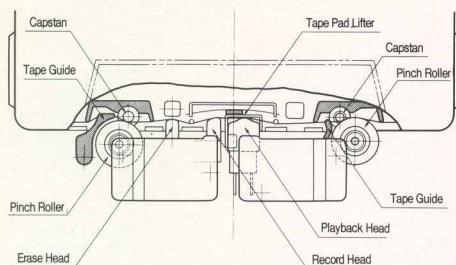
Discrete Head Configuration

As shown below, the heads are located between the two capstans to insure stable tape tension and uniform tape-to-head contact, while slot guides at each capstan position the tape more precisely than is possible with fork guides.

• Playback Head

The P-8L play head has a high-permeability, low-coercivity Crystalloy core to improve efficiency and reduce noise. Its extremely narrow 0.6-micron gap achieves extraordinary high-frequency response while polepiece geometry has been refined to eliminate contour effect and extend low-frequency response smoothly to the subsonic region. A special shape prevents unbalanced core wear and extends service life to 10,000 hours.

• Record Head

The R-8L record head also utilizes a laminated Crystalloy core to assure minimum high-frequency self demagnetization. A 3.5-micron gap with carefully defined critical recording zone enables complete penetration fo the tape coating and exceptionally high maximum operating levels (MOL) with any type of tape. Like the playback head, a special contact shape extends service life to 10,000 hours.
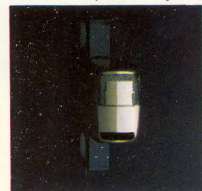
• Erase Head

The E-8L erase head combines the excellent high-frequency properties of a ferrite core with the superior flux-handling ability of Sendust poletips. Its high-efficiency winding and double-gap design assures complete erasure of metal tape.
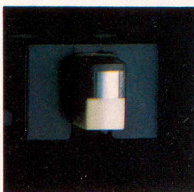
Mechanism

Nakamichi's unique tape-transport mechanism eliminates every trace of flutter.

Progress in transport design has been little short of amazing and has been reflected in steadily falling wow-and-flutter ratings. However, specifications do not tell the whole story. Even those made in accordance with DIN standards ignore the scrape flutter and modulation noise that adversely affect music clarity. The 700ZXL and 700ZXE transport mechanisms have been designed to ensure *both* stable tape motion (low wow) *and* to suppress scrape flutter and noise.

• Asymmetrical Concept

While it is well known that dual-capstans isolate the tape from reel perturbations, few have considered the mutual resonances created. Two capstans rotating at the same rate magnify flutter components at their resonance frequencies making flutter more audible than specifications would suggest. Thus, Nakamichi transports have "asymmetrical" capstans and flyweels that rotate at different rates to eliminate this common-mode resonance.

• Eliminating Vibration

If the tape vibrates as it passes the heads, flutter and noise are generated. Partially, this originates with motor vibration so we construct our transport on an aluminum chassis coated with vibration-damping resin. Another source of motion irregularity is tape contraction and expansion due to variations in holdback and
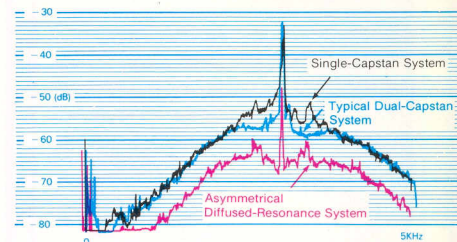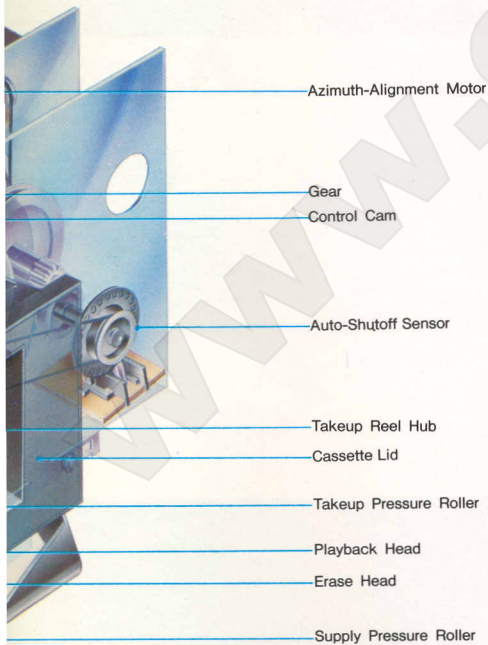

Modulation Noise Analysis
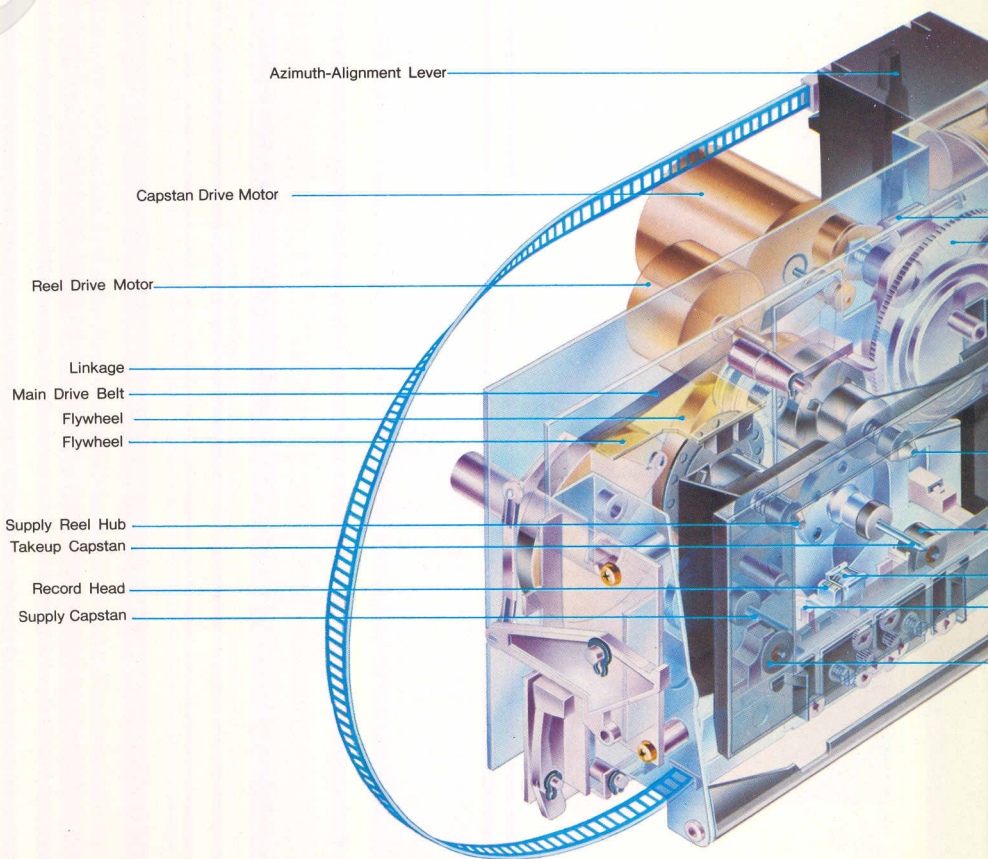
takeup tension and to friction between the tape and the heads and pressure pad. We have paid particular attention to these areas. In fact, tension is controlled so precisely that proper tape-to-head contact is maintained without a pressure pad. A unique "lifter" forces it out of the way thus eliminating this very important source of flutter and modulation noise. By holding the pad away from the tape, the effects of pad-spring vibration are totally eliminated.

• Silent Mechanism

Feather-touch keys activate C-MOS IC logic that interprets each command and inserts the logically correct intermediate steps to prevent tape damage. You may switch from either fast-wind mode to play in complete safety. The logic also accepts instructions from the remote-control units and permits several keys to be used for dual functions such as Rec. Mute and Easy Cue.

The logic controls a unique motor-driven cam that positions heads, engages brakes, and performs every function normally associated with solenoids but does so more quietly, more gently and precisely, and with less power-consumption and heat buildup. The main capstan motor is a PLL servo type that immediately senses and corrects speed error.

Azimuth-Alignment Motor

Gear

Control Cam

Auto-Shutoff Sensor

Takeup Reel Hub

Cassette Lid

Takeup Pressure Roller

Playback Head

Erase Head

Supply Pressure Roller

Amplifier

State-of-the-art electronics afford high-fidelity recording and playback.

With their potential to achieve optimum results with any tape, the 700ZXL and 700ZXE are in a class by themselves. True high-fidelity electronics are all the more important lest the benefits of optimization be wasted. We have spared no effort in designing the most advanced circuitry and in using the very highest quality components to assure exceptional dynamic range and low distortion.

• Playback Amplifier

Direct coupling of the playback head to the first stage of amplification (700ZXL only) plus Double-NF equalization circuitry produce greatest DC stability and lowest distortion.

• Recording Amplifier

Direct coupling of the recording head to the recording amplifier and Double-NF circuitry reduce distortion in the recording chain. There are *three* microphone channels — left, right, and blend (center) — as well as a mixing line input. Subsonic and MPX filters eliminate interference.

Noise Reduction

Internal Dolby-B NR and jacks for external NR systems provide maximum flexibility.

With the 700ZXL and 700ZXE you have freedom of choice in noise-reduction systems. Dolby-B

Low-Level Encoder Response (−60 dB)

700ZXL Frequency Response/Noise Analysis
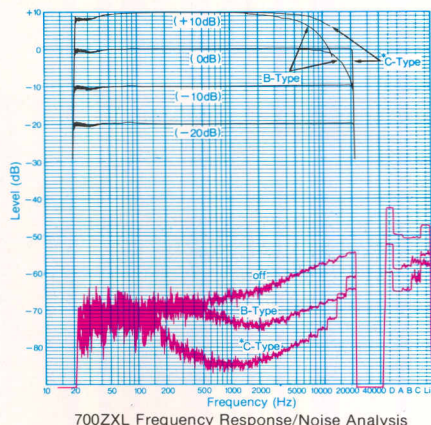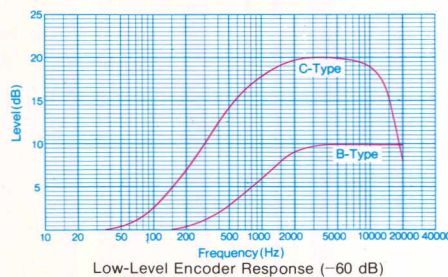
NR is built in, and there are provisions for *external* NR systems such as High-Com II or the NR-100 Dolby-C processor. The NR-100 does not require adjustment and provides up to 20-dB noise reduction in the critical region between 2 kHz and 8 kHz. Dolby-C technology also improves high-frequency headroom and provides flat response to 20 kHz at the 0-dB recording level.

NR-100 Dolby C-Type NR Processor

Display

Electronic display panel includes peak-level meters, 4-digit counter, Auto Cal and RAMM.

• Auto Calibration/RAMM display

An electronic display indicates the status of the A.B.L.E. processor (700ZXL) and auto-tuning mechanism (700ZXE) as well as the choice of noise reduction and RAMM program.

• LED Peak-Level Meters

Electronic bar-graph peak-level meters with a 50-dB range (−40 dB to +10 dB) accurately indicate recording levle. With 30 segments per channel, resolution is much better than typical bar-graph displays. In the peak-hold mode, the display resets in 6 to 7 seconds.

• 4-Digit Electronic Tape Counter

With 0000 as the reference, this LED digital display counts up to 9999 and down to -999. Via the memory switch, memory play/stop are possible. By electronically counting revolutions of the reel shaft, the correct starting position is determined with practically no error.

Operation

Soft-touch buttons activate sophisticated IC logic providing safe, gentle tape handing.

A feather touch of PLAY, FF, REW, PAUSE, or STOP informs sophisticated C-MOS logic of your desire. The logic activates the motor-driven cam control system and enables direct switching from rewind to playback in complete safety. It also provides Rec. Mute and an unusual two-speed cueing feature by which the precise start of a program can be located quickly and accurately.

700ZXE Auto Tuning Cassette Deck

Features An Auto Calibration Processor That Aligns Azimuth And Adjusts Bias And Level For Any Tape Automatically Plus A RAMM System For Program Selection.

Auto Calibration Processor
(Azimuth, Bias, Level)

Automatically aligns azimuth and adjusts bias and recording level for each tape to achieve a remarkable response of 18 to 23,000 Hz ±3 dB.

To achieve optimum performance from the many cassette formulations on the market requires that bias and recording level be adjusted for differences in tape characteristics. And, to achieve response beyond 20 kHz — once considered an insurmountable barrier — azimuth alignment must be near perfect. Since imperfections in cassette housings cause the tape to follow slightly different paths past the heads, azimuth must be aligned for each cassette. These adjustments can be made manually with the proper test equipment, experience, and patience. But it's much easier with the 700ZXE. It performs these crucial adjustments automatically and remembers the ideal settings until the next adjustment operation is performed. It's electronic memory is fully protected against erasure when power is switched off in the timer-recording mode. Using the 700ZXE Auto Calibration Processor is quite simple. The tape-selector and equalization switches are set for the type of tape

being used — ferric (EX & 120 μs), chrome (SX & 70 μs), or metal (ZX & 70 μs) — and the deck is put into the record/standby mode by pressing RECORD and PAUSE. Now pressing PLAY and AUTO CAL starts the automatic calibration procedure diagrammed at the lower left.

A 400-Hz 0-dB signal is recorded and reproduced, and the record-head azimuth and level are adjusted. Next, 400-Hz and 15-kHz tones are recorded at −20 dB, and bias is adjusted to produce equal outputs. Since bias affects sensitivity, the recording level is adjusted once again to refine the setting.

During calibration, the Auto Cal display flashes; after calibration, it is steadily illuminated and tape automatically rewinds to "0000." If the adjustment cannot be completed satisfactorily, the tape stops and the display continues to flash as a warning.

After proper calibration, the 700ZXE attains a frequency response of 18–23,000 Hz ±3 dB (20–20,000 Hz ±2 dB) at −20 dB — an achievement long thought to be beyond the capability of the cassette medium!

RAMM
(Random Access Music Memory)

An auto playback system capable of selecting any desired program by skipping from 1 to 9 programs in either direction.

Frequently, you'd like to skip over the first few programs on a tape and perhaps first listen to the third or fifth selection; then you might like to skip back and hear the second program. Of course, you can find any program you'd like with the Easy Cue feature of the 700ZXE, but we've made things even simpler.

The 700ZXE RAMM is easily programmed via "up" and "down" buttons to skip over from 1 to

9 selections either in fast forward or in rewind. The number of programs to be skipped appears in the RAMM display which indexes downwards as each program is counted off. RAMM keeps track of where it is by detecting the blank tape between musical selections.
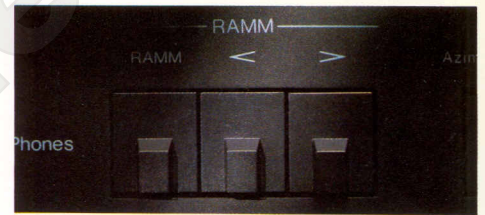
Remote Control

With its sophisticated internal logic, the 700ZXE can be operated from your easychair.

With the optional RM-200 Remote Control Unit, every tape operation including RAMM instructions can be commanded from your listening position. Since the Easy Cue and Rec. Mute features also are accessed through the transport controls, these are remotely controllable as well. From its front panel or remotely via the RM-200, the 700ZXE is always at your command.
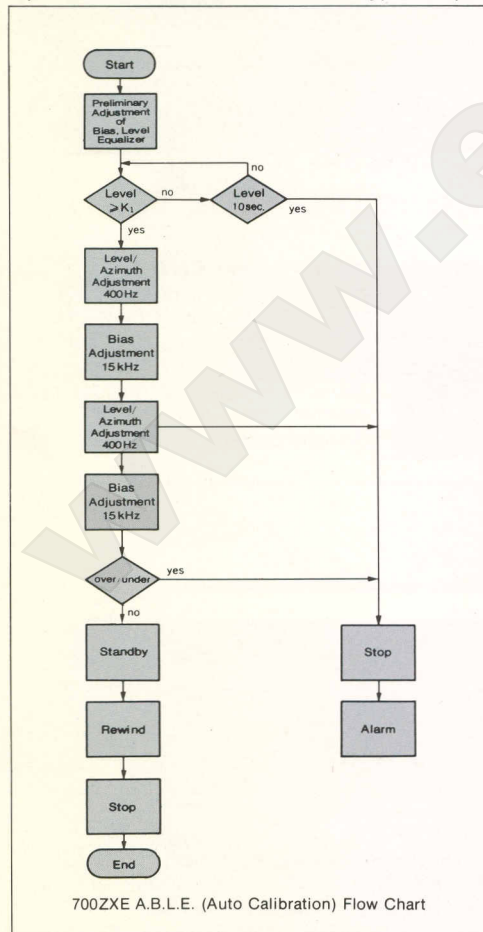

700ZXE A.B.L.E. (Auto Calibration) Flow Chart

Features

700ZXL Only
- Auto Calibration Of Azimuth, Bias, Level, And Equalization Via A.B.L.E. Processor With 4 Tape Memories
- 15-Program Encoding RAMM With 30-Command Memory For Random Access Playback

700ZXE Only
- Auto Calibration Of Azimuth, Bias, And Level With Electronic Memory
- RAMM Capable Of Skipping From 1 to 9 Programs In Either Fast Forward Or Rewind

700ZXE And 700ZXL
- Seldom Used Controls Concealed Behind Hinged Panel
- Calibration, Tape Choice, EQ, Noise Reduction, And RAMM Indicators
- Discrete 3-Head Technology
- 4-Digit Electronic Tape Counter (-999 to 9999)
- 30-Segment LED Digital Recording-Level Meters With 50-dB Range And Simultaneous Peak And Peak-Hold Indications
- Three Microphone Inputs Plus Microphone/Line Mixing
- Built-In Double Dolby-B NR With Provision For External Noise-Reduction Systems Such As High-Com II Or NR-100 Dolby-C Processor
- MPX And Subsonic Filters
- Test Tone Oscillator (400 Hz, 0 dB, 200 nWb/m)
- Record Mute
- High-Fidelity Record And Play Amplifiers Plus High-Output Headphone Amplifier
- Asymmetrical, Dual-Capstan, Diffused-Resonance Transport
- C-MOS Logic Control Via Motor-Driven Cam
- Timer Operation And Tape-Start Memory
- Pitch Control ($\pm6\%$)
- Remote Operation Via RM-300 (700ZXL Only) Or RM-200 (700ZXL And 700ZXE)

- Specifications and appearance subject to change for further improvement without notice.
- Dolby NR under license from Dolby Laboratories Licensing Corporation.
- The word "DOLBY" and the Double-D-Symbol are trademarks of Dolby Laboratories Licensing Corporation.
- High-Com is the trademark of AEG-TELEFUNKEN.
- A.B.L.E. is the trademark of Nakamichi Corporation.

700ZXL/700ZXE Specifications

Power Source	100, 120, 120/220-240, 220 or 240V AC; 50/60 Hz (According to country of sale)
Power Consumption	50W Max.
Tape Speed	1-7/8 ips. (4.8 cm/sec) $\pm0.5\%$
Wow and Flutter	Less than 0.08% WTD Peak, 0.04% WTD rms.
Frequency Response (W/Auto Calibration)	700ZXL: 20–20,000 Hz ±1.5dB (18–24,000 Hz ±3 dB) 700ZXE: 20–20,000 Hz ±2 dB (18–23,000 Hz ±3dB) (−20 dB Rec. Level)
Signal-to-Noise Ratio	**Dolby B-Type NR in** (70μs, ZX Tape) Better than 66 dB at 400 Hz, 3% THD, IHF A-wtd rms **Dolby C-Type NR in** (W/Optional NR-100 Processor, 70μs, ZX Tape) Better than 72 dB at 400 Hz, 3% THD, IHF A-wtd rms
Total Harmonic Distortion	Less than 0.8% at 400 Hz, 0 dB, ZX Tape Less than 1.0% at 400 Hz, 0 dB, SX, EXII Tape
Erasure	Better than 60 dB at 100 Hz
Separation	Better than 37 dB at 1kHz, 0 dB
Cross Talk	Better than 60 dB at 1 kHz, 0 dB
Bias Frequency	105 kHz
Input (Line)	50mV, 50k ohms
(Microphone)	0.2mV, 10 k ohms
(Noise Reduction)	100mV, 50 k ohms
Output (Line)	1V (400 Hz, 0 dB, Output Level at Max.) 2.2k ohms
(Noise Reduction)	100mV, 2.2 k ohms
(Headphone)	45mW (400 Hz, 0 dB, Output Level at Max.) 8 ohms
Dimensions	500(W) x 262(H) x 250(D) millimeters 19-11/16(W)x10-5/16(H)x9-27/32 inches
Approximate Weight	14 kg, 30 lb. 14 oz.
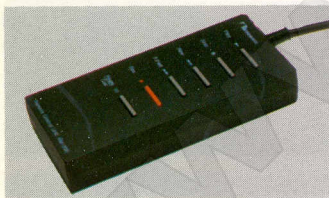
RM-200 Remote Control
Provides remote control of all tape operations including RAMM programming of the 700ZXE. Provides control of all tape operations excluding RAMM programming on the 700ZXL. (5-meter cable)

RM-300 Remote Control
(Not for use with 700ZXE.) Provides remote control of all tape operations including RAMM programming of the 700ZXL. Includes 4-digit electronic tape counter. (5-meter cable)