

# TAPE CARTRIDGE MACHINE HISTORY



# 1944

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ Jack Mullen, US Signal Corps, was stationed in England and working at night
- ✖ Monitored German radio in early AM and puzzled by excellent audio quality



# 1945

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ Mullen was moved to France to examine everything electronic captured from the Germans
- ✖ Found German Magnetaphons (tape recorders) but the audio quality was poor

# 1945

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ Mullen was dispatched to Frankfurt to look for source of radio interference
- ✖ Made a side trip to Radio Frankfurt, got a Magnetaphon demo and was bowled over by the excellent audio quality
- ✖ Photographed the IM's and schematics and discovered the secret ingredient: High Frequency AC Bias

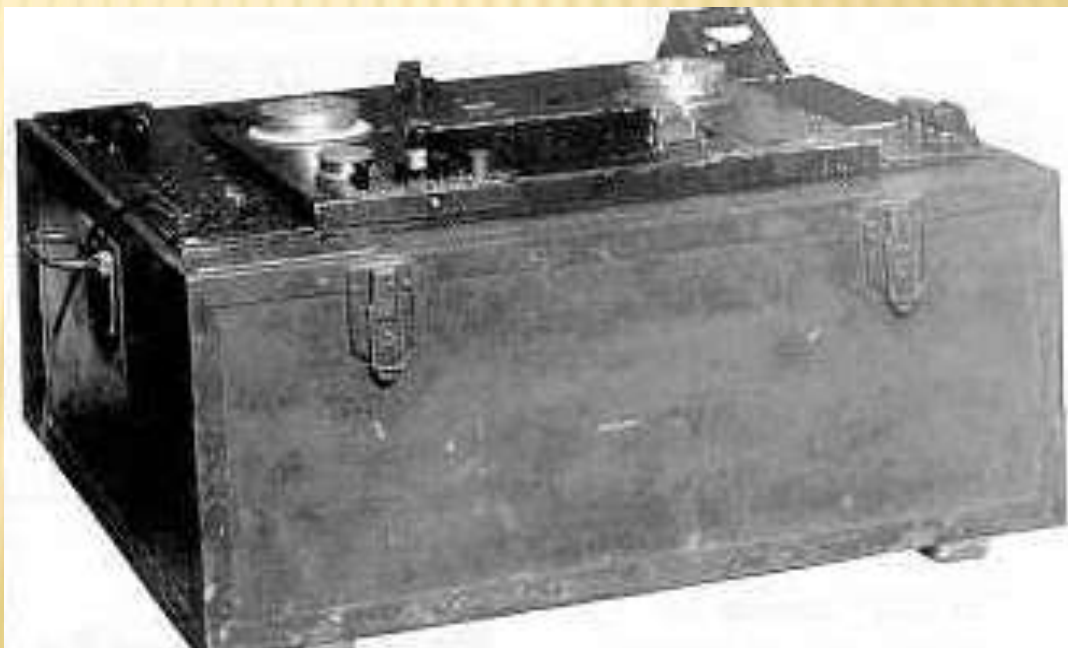


# 1945

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ Mullen “liberated” two Magnetaphons
- ✖ Shipped transports (piece by piece) along with 50 reels of tape to his home in San Francisco
- ✖ 30 IPS



# 1944

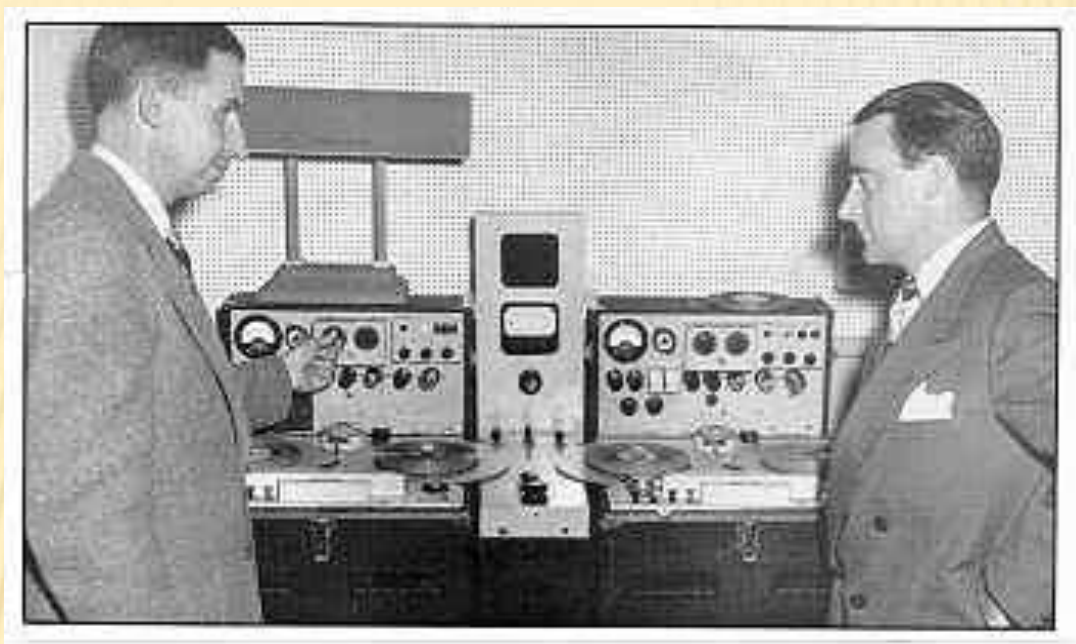
50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ Mullen built his own electronics and added pre-emphasis to improve the frequency response
- ✖ Road Show to L.A.

# 1946

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✕ Jack Mullin (left) showed his modified Magnetaphons to Murdo McKenzie, Bing Crosby's technical producer - and also to Alexander M. Poniatoff (Initials AMP—)



# 1947

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ Bing Crosby hired Mullen to record and edit his radio show.
- ✖ More machines were required for editing.
- ✖ Mullen's Magneta-  
phons were replicated  
and became the  
AMPex Model 200.





50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



# Late 40's

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ Revolutionized the broadcasting and recording industries.
- ✖ Reel-to-Reel machines well suited for long, discrete programs of 40's – the half-hour and hour long radio shows.

# 1951

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ A new type of music is sweeping the nation
- ✖ Rock-and-Roll (rāk'n roll') n. first s used (1951) by Alan Freed, Cleveland disc jockey, taken from the song "My Baby Rocks Me with a Steady Roll"





# 1951

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ New type of radio emerged – “Top 40”
- ✖ Combo operators were very busy playing fast-paced, short, recorded segments.
- ✖ They could hardly keep up, and you might say, “There was a whole lot of shaking going on”



# Summer of 1958

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✕ Moulic Specialties building Background Music Machines using endless-loop tape cartridges invented by George Eash at Cuisino.



# 1950's

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



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## Moulic Background Music Machine



# Summer of 1958

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ WJBC Manager, Verne Nolte bought one
- ✖ Nolte wonders if it can be adapted to record and play commercials & jingles
- ✖ Nolte consults with Engineers  
Fred L. “Ted” Bailey  
John P. “Jack” Jenkins

# Summer of 1958

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✧ Bailey & Jenkins came up with the concept and built three prototypes at WJBC transmitter site



# Summer of 1958

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ Viking decks with belt-drive motors
- ✖ 7 ½ IPS Speed for professional audio quality
- ✖ Gear motors (rotary solenoids) for full-swing Pressure Roller Control (slow)
- ✖ 1 KHz “cue tone” (because Bailey happened to have some 1 KHz oscillators on hand)



# Fall of 1958

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✗ Machines went into use at WJBC
- ✗ Shown at Illinois Broadcasters Convention in October, 1958
- ✗ Automatic Tape Control was created – No Manufacturing & No Marketing Capability

# Fall of 1958

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✗ Bailey & Jenkins take concept to Gates Radio Company
- ✗ Parker Gates revealed Gates ST-101 – expected to revolutionize broadcasting
- ✗ Return to B-N somewhat dejected
- ✗ Prototypes go to WIZZ in Streator, IL.
- ✗ Machines shown to Collins salesman

# 1959

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ January, 1959 – John Haerle, Collins Sales Manager, called for appointment
- ✖ Flew to Bloomington from Cedar Rapids, got a demonstration, and signed a marketing agreement over lunch
- ✖ Plans set for introduction at 1959 NAB



# 1959

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✘ Moulic Specialties assembled machines with Viking decks and a Big Linear Solenoid - full-swing pressure roller
- ✘ ATC built modular, tube electronics
- ✘ Collins Radio built cases – no ventilation
- ✘ Machines & Cases arrived in Chicago

# 1959 NAB Convention

50<sup>th</sup> Anniversary

Broadcast Tape Cart Machine



- ✘ Machines overheat & diode problem discovered the day before NAB opened
- ✘ Crew worked all night replacing diodes
- ✘ 1959 NAB Convention opened at the Conrad Hilton Hotel in Chicago
- ✘ The Collins/ATC “P” Series Cartridge Machine were the hit of the show

# 1959 NAB Convention

50<sup>th</sup> Anniversary

Broadcast Tape Cart Machine



- ✗ Generated more than \$100,000 in sales to 45 radio stations.
- ✗ ATC was faced with a small problem
  - How to Fill the Orders!
- ✗ Claim to “first cart machine” is disputed, but it seems safe to say that ATC had the first commercially available cart machine

# 1959

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✕ Simultaneously Ross Beville, of WWDC was working on the Spotmaster
- ✕ Shown at D.C. area audio/hi-fi show in fall of 1958





# 1959

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ Beville was unaware of ATC machine until 1959 NAB Convention
- ✖ Broadcast Electronics chartered in June, 1959 to manufacture and market Spotmaster.

# 1959

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ Beefed up Viking Deck with Belt-Drive Motor
- ✖ 850 Hz cue tone - changed to 1 KHz after approximately 50 units
- ✖ Slightly different head configuration
- ✖ Manual Lever to bring pressure roller into the cartridge & smaller solenoid to engage tape

# 1959

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✕ Transistor Playback & Tube Recorder
- ✕ First production model sold to WQSN in Charleston, South Carolina
- ✕ Austin Knox, engineer & Jack Neff, sales

# Competing Formats

50<sup>th</sup> Anniversary

Broadcast Tape Cart Machine



- ✖ Mackinzie 5CPB Program Repeater (1959) – Record on Reel-to-Reel, wind into magazine, splice, paint reflective stripe at beginning.
- ✖ Gates ST-101 (1959) - used 13-inch wide tape belt, 101 cuts, 90 second maximum length, 8 KHz upper audio limit.



# Competing Formats

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✗ RCA Wide-Belt, Multi-Track Machine (1959) - similar to Gates ST-101. Never sold.
- ✗ Schafer Spotter (1959) modified reel-to-reel machine with photo sensors to count 99 windows in tape to cue proper cut.

# Competing Formats

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ RCA Magnetic Disc Recorder (1959) used disks (size of a 45 RPM record) with spiral grooves. Ran at 33 1/3 RPM and could be cued manually or automatically in a changer.
- ✖ Ampex AG-100 Cue-Matic (1965) used 11 3/4" circular magnetic mats "for announcements and other program material by radio stations"
- ✖ This may have been the first floppy disk

# 1960's

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



## Early Competing Cartridge Machines:

✕ ATC/Collins  
“P & PB Series”



✕ ATC  
PC & Criterion”



# 1960's

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



## Early Competing Cartridge Machines:

× Spotmaster



× Collins 642





# 1960's

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



## Early Competing Cartridge Machines:

× Gates



× Moulic, MaCarta,  
Sono-Mag



# 1960's

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



## Early Competing Cartridge Machines:

✕ RCA (Ampro)



# 1960's

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



## Early Competing Cartridge Machines:

✕ Sparta - Bill Overhouser





# 1960's

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



## Early Competing Cartridge Machines:

✕ **Tapecaster – Paul Shore**





# All-Cart Format

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



## Arrives

- ✘ WLS started all cart with the format change from Prairie Farmer in the late 50's. They were using P- series ATC hardware and the Cart Machine was a prime motivator for ABC because it minimized the Musicians Union Record Turner. Fred Zellner was the chief at KQV Pittsburg and later at WLS and was the prime instigator of the cart revolution. (check the ABC archives for dates)

WCFL had some early RCA machines (with the big button in the middle) that came with the RCA build-out in the early 60's. I started there on November 1, 1965 and my first function was to edit "Turn Turn Turn" by the Turtles and put it on a cart. Within 60 days George Stephenson had installed ATC machines and from then on everything was on cart.

Many markets were suspicious of carts when P series were the only choice and committed only spots to cart, but the later direct drive ATC's made it a lot safer to commit music to cart.

In Chicago, WLS and Zellner provided the impetus to go cart for the rest of the market. Zellner had gone on to New York by the time I got to Chicago.

- ✘ It's a wonder I can remember this stuff. Actually, the memories are very vivid.

Jim

# EARLY 60'S

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✘ Meanwhile, back in Bloomington-Normal
- ✘ Moulic Specialties built the first 2,100 P Series Machines for Collins/ATC
- ✘ ATC came up with the PB Series with a cast aluminum deck and different solenoid linkage assembly – Built by TRW and sold by Collins

# EARLY 60'S

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✕ Moulic starts selling their own cart machines under the MaCarta logo.
- ✕ Collins and ATC split
- ✕ Collins introduces their 642A Cart Machines

# ATC - EARLY 60'S

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ Starts manufacturing and marketing their products on the third floor of the Castle Theater building above the WJBC Studios.
- ✖ Introduces the PC Series – essentially the PB Series with a secondary cue tone
- ✖ Launches the ATC 55 that plays 55 cartridges in sequence
- ✖ Introduces a line of Program Automation Systems



## 50<sup>th</sup> Anniversary Broadcast Tape Cart Machine



# MOULIC - EARLY 60'S

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ Changed name to Sono-Mag Corp
- ✖ Introduced the Carousel 24-Cart sequential player (later to become a bi-directional and random access machine.)
- ✖ Offers a line of program automation systems.



# ATC - MID 60'S

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✖ 1964 ATC's Jack Jenkins started working with Preston Weaver at Beau Motors on a direct-drive, inside-out (rotor on outside) motor – Jenkins insisted on 450 RPM for maximum tape contact
- ✖ 1965 ATC introduced the Criterion Series using the direct-drive motor, stereo, transistorized electronics, and the PB/PC cast deck and solenoid linkage (a bit complex)



# ATC - MID 60'S

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✕ 1966 Automatic Tape Control was sold to the Gates Radio Div. of Harris Corporation. Harris seemed to be primarily interested in program automation





## Time for a little cart machine maintenance

ATC's Dave Wolfenden  
creates the  
Hippy Dippy Test Tape



# LATE 60'S

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✕ 1969 Harris announced that ATC would be moved to Quincy, Illinois
- ✕ Franklin, Jenkins, Rector, and Wilson left to start International Tapetronics Corporation (ITC)

# LATE 60'S

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✘ ITC introduced the Premium Line of Cart Machines – the SP, RP, and 3D Series
- ✘ New, simplified solenoid linkage assembly – great success
- ✘ 450 RPM, Direct-Drive Motors – Proven



- ✗ Used pressure roller with nylon bearing  
– bad news
- ✗ ITC got permission to use Collins pressure roller tooling Minnesota Rubber Co



# LATE 60'S

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✘ Merle Wilson built a special tool to replace pressure roller shaft. Success!
- ✘ ITC used a direct sales approach – very successful
- ✘ Plough Broadcasting becomes first major customer

# LATE 60'S

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✗ ITC started selling 220 Volt, 50 Hz machines in Great Britain and the motors started over heating
- ✗ ITC starts looking for a new motor supplier
- ✗ ITC introduced the Encore Series
  - a near disaster

# THE 70'S

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✘ Carl Martin, design engineer, broke away from ITC and starts Audi-Cord Corporation
- ✘ Martin was probably the only full-time employee of all four B-N cart machine manufacturers
- ✘ Audi-Cord introduced a new line of less expensive machines with 600 RPM motor

# THE 70'S

50<sup>th</sup> Anniversary  
Broadcast Tape Cart Machine



- ✕ 1979 ITC introduced the Series 99, a micro-processor based machine with auto azimuth alignment, built-in tape eraser, servo-motor control,





- ✘ Pacific Recorders & Engineering (PRE) introduced the Tom Cat cart machines with an innovative mono/stereo compatible head design – an impressive machine
- ✘ January 1, 1982 ITC is sold to 3M Company
- ✘ 3M introduced a new line of Scotch Carts

# LATE 70'S – EARLY 80'S

50<sup>th</sup> Anniversary

Broadcast Tape Cart Machine



- ✖ Beau Motors introduced the Beau Cart
- ✖ Fidelipac introduced the Dynamax machines
- ✖ 3M/ITC launched the Delta Series



- ✕ Mid 80's – Digital Audio starts to appear
- ✕ 1990 3M sells ITC to Canadian investors
- ✕ 1991 Carl Martin sells Audi-Cord to Andy Rector
- ✕ 1999 Essentially the end of the Cartridge Era
- ✕ 40 years after the 1959 introduction



- ✕ That's a quick History of the Broadcast Tape Cartridge Machine
- ✕ Thanks for your time and interest!





# CREDITS

- ✘ David T. MacFarland, PhD – “Archaeology of the Broadcast Tape Cartridge” (Kansas State Univ.)
  - ✘ Fred L. Bailey
  - ✘ N. Elmo Franklin
  - ✘ Jack Sellmeyer
  - ✘ Jim Loupas
  - ✘ John Burtle
  - ✘ Other friends and associates too numerous to mention
- John P. Jenkins  
William E. Moulic  
Jack Mullen  
Dave Wolfenden  
Mike Flood