The History of Collins Radio Co.
My Interest in Collins

THEN
(in late 60’s at my ham family’s S-line station)

NOW
(recreated Collins S-line in The Villages)
KWM-2 from my grandfather-in-law
Mom and Dad in Halloween Collins S-Line Radio Box costumes
"It was natural to compromise on equipment at first. Gradually your station improved. But, you’re still dissatisfied. You’ve spent frustrating years with a series of rigs. Even if it costs more, you’re thinking about a station that offers truly dependable performance, more enjoyment, fewer headaches. Now is the time to talk it over with your Collins distributor. You’re ready for the S-Line or the KWM-2A."

"Collins equipment. You’re ready for it now."
Similar ad concept was used by the world renowned Hasselblad cameras.

Ad headline: “You don’t just buy a Hasselblad, you work your way up to it.”
The pioneering spirit of problem-solving and innovation that guides Rockwell-Collins today is the same inspiration that made Collins a leader in radio communication.

Listening to today’s RC engineers reveals the vision that Art Collins team ORIGINALLY at the founding of the company..
Important threads that run through Collins’ continued success from the start are *nimble breakthroughs to solve problems achieved by Collins selection of the most renowned R and D team* of engineers. It’s the same today and a good way to introduce the ingenious and cutting edge company that Arthur Collins created in the 1930’s.

“The basement of this home at 1620 6th Avenue SE was the first factory in which Arthur Collins produced radio transmitters to order.”
Big Picture
50 years
Major achievements and technical breakthroughs of Collins Radio

• Main concern was technical innovation and achievement which produced necessary, but not high priority profit

• Collins adapted his skills to a wide range of applications in radio communications (military, manned spaced flight, aircraft, amateur radio, etc.)
Collins equipment was out of the limelight but a part of many historic events like the broadcast of the Japanese surrender on the battleship Missouri by a Collins transmitter, Voice of America, spacecraft radios for the Mercury, Gemini, and Apollo spacecraft, Collins systems transmitted TV of astronauts on the moon.

“No single person has been more responsible for the ability of air transports to fly and land safely in adverse weather conditions.

Equipment he developed gave America and its allies a significant edge in WW2, Korea, and Vietnam.
Big Picture
50 years
Major achievements and technical breakthroughs of Collins Radio

- HF SSB development was a major advance for US commanders for around the world communication prior to satellites.
- Made innovations in broadcast transmitters
- Dependable data transmission
- Computer innovations

“Ralph Waldo Emerson wrote than an institution is the lengthened shadow of one man. Arthur Collins left a long and lasting shadow.”
Arthur Collins in the 1920’s
“At about the age of nine,” Arthur Collins became deeply interested in the new marvel of radio. The sets used variable condensers inside a tube. From iron plates they fashioned their own transformers, and rigged a 60-foot spark antenna with a lead-in through a basement window of the Lund home.

Collins: “I used a Quaker Oats box to wind the tuning coil and used a Model T spark coil,” he told a New York Times reporter in 1962. “The main piece of the station’s machinery was the transmitter. Other parts of the station were recruited from a rural telephone service. The way we calibrated was to pick up signals from WWV (the Navy’s station in Arlington, Virginia).”

The Federal Radio Commission, the predecessor to the Federal Communications Commission, passed a radio act whereby amateurs could get licenses. Arthur took the test and got his license in 1923 at the age of 14.
“Gladys Arne, (a reporter) had gone to the Collins home to talk with the 15-year-old boy because he had made a radio contact that put him on the front pages of newspapers all over the country.


The plan was for the Bowdoin to make daily radio reports to the U.S. Naval radio station, but because of atmospheric problems, the land station in Washington, D.C., was unable to consistently receive Reinartz’s messages. Then word spread that a 15-year-old boy in Cedar Rapid’s had made contact with the expedition.
Throughout the summer of 1925, Arthur Collins accomplished a task that even the U.S. Navy found difficult. **Using a ham radio that he himself had built, he talked by code with the MacMillan expedition in Greenland night after night.**

Collins’ exclusive contact with the expedition soon became a nationwide news story that won him acclaim as a radio wizard.
At the age of 16, Collins was asked to write a technical article for Radio Age which was published in the May, 1926 issue. One statement in that article foreshadowed the motivational force which was to lead him to “great radio ambitions.”

“The real thrill in amateur work comes not from talking to stations in distant lands ... but from knowing that by careful and painstaking work and by diligent and systematic study you have been able to accomplish some feat, or establish some fact that is a new step toward more perfect communication.”
In 1927, he and two friends organized an expedition of sorts of their own. Collins, Paul Engle, and Winfield Salisbury outfitted a truck with short wave transmitting and receiving equipment and took a summer trip to the southwest states. Using power of 10 watts they conducted experiments in connection with the U.S. Naval Observatory in Washington, D.C. Leo Hruska stayed behind in Cedar Rapids to operate the base station for the study.
Collins Radio Co.
in the 1930’s
When the depression hit with full force in 1931, 23-year-old Collins turned his hobby into a vocation. “I picked what I was interested in,” he told Forbes magazine years later, “and looked for a way to make a living.”

This was the first time radio transmitting apparatus, of any power output, was available for purchase as an assembled and working unit. In fact, components were hard to come by; they varied widely in characteristics, and there was little, if any, pattern to their construction. Most hams had their radio equipment scattered around a room, usually in a basement or attic where the sight of tubes and wires wouldn’t clutter up living areas of a home. Their equipment was strictly functional, almost to the point of inefficiency.
The Start of Collins Radio Co.

Collins’ ham gear was designed to eliminate the clutter by packaging the equipment in neat units. The concept proved that correctly engineered construction not only stabilized the circuitry but also made its behavior predictable. Collins designed circuits, fabricated chassis, mounted and wired in components, tested, packed and shipped each unit. Because the gear was precisely engineered and well-built with the best parts available, it gave years of trouble-free service.

A later article in the New York Times quoted a ham as saying, “Collins brought us up from the cellar and put us into the living room.” The industrial philosophy of Collins products “quality” was established at the very start.
Noteworthy:

- At this time, Art called his company Radio Laboratories, Inc. W9CCX and added his personal name.

- This was a kit.
The 30W was the very FIRST assembled and tested Collins transmitter offered to the general amateur community. Each unit had a Bakelite front panel attached to a steel chassis. Although primitive in comparison to later Collins products, the hallmarks of Collins transmitter philosophy were established in its design.

- 10A crystal controlled unit – 247 crystal oscillator, 247 buffer amp, 210 output.
- 3 plug-in coils wound on Hammarlund coil forms
- Basic building block of 40B and the 150A/B transmitters
- Optional antenna tuner
The 150B was the first Collins product to ever appear in a Collins QST ad (May 1932) containing a photograph.

During this period, home-brew transmitters constructed on breadboards were common in ham shacks. The fully enclosed, rack-mounted, professionally appearing 150 series was a dramatic contrast with the breadboard and had instant appeal to the ham who could afford one.

- 150 watts
- 150A was the exciter – CW only - $290 in 1932 during depression
- 150B add 30B modulator – class B - $350 in 1932
The 40A/B was Collins’ *first desktop phone transmitter*. Based on the 30W, it added a 9C amplifier-modulator and antenna tuner unit. Plug-in coils for 160, 80, 40, and 20 meters were available

- 40A – CW only / 40B ran 30 watts
- External input amp. provided
- necessary gain with a mic.
- Unit price - $235
Collins series 2A, 2B, 2C Tuners 1933

Original 2C tuner in Collins 150C transmitter

2C shown rebuilt for 30FXB
The 32 series was introduced with the 32A 25 watt CW transmitter. It used a 47 as the crystal oscillator, a 46 buffer and a pair of 46’s in the final. Phone version already rated at 25 watts.
The 4A was Collins answer to a low-cost basic CW transmitter that the average ham could justify. This was due to the fact that the combined cost of the parts was greater than the $58.50 purchase price.

- Built-in power supply
- Used isolantite plug-in coils for each band sold as an option (2 for $5)
- 25 watts
- 47 oscillator driving parallel 46’s.

(from December 1933 QST)
This was a floor-standing 100 watt phone and CW transmitter that was designed to replace the aging 150 series. The November 1934 QST ad stated: “It’s ultramodern dress will lend an air of distinction to anyone’s library.”

Introduced in one of the last B/W ads.

- 100 watts from 160 to 20 meters
- Crystal controlled with 10J excited and a 203A in the final modulated by a pair of 830B’s
- Collins targeted the commercial and ham markets with the product
There are only 3 or 4 units known to exist. Never advertised in QST.

- 47 crystal oscillator into a 841 buffer amp driving a pair of 841’s
- 25-30 watts on phone and cw.
- 32F may have been intended as the replacement for the aging 32B
VERY POPULAR - While floor standing transmitters were the norm for medium powered CW transmitters, the 45A was a sharp looking self-contained desktop transmitter.

- 120 watts CW, 40 watts phone
- Sold to amateurs, commercial users, and police departments.
Collins 32FX Transmitter – 1935

AD COPY - “The ideal 1935 transmitter – it is simple to adjust – its cost is low and its performance is guaranteed. Here is a transmitter (final 211 triode) capable of putting into your antenna a full 100 watts of CW power, or a phone carrier of 40 watts.”
The 32G was a \textit{celebration of the new 6L6} and was offered as a general purpose HF transmitter in \textit{both the amateur community and to commercial markets}.

- 40 watts CW and phone, 160 to 10 meters
- Plug-in coils
- Cathode-ray oscilloscope modulation indicator and a universal antenna matching network
The FXC was the successor to the popular 30FXB phone/cw transmitter. It was rated at 175 watts (but proudly boasted over 200 watts) output on AM and CW and covered 160 to 10 meters.
The 30FXR is basically a “reduced” version of the 30FXC. The FXR can be converted to a standard FXC. The performance of the FXC is identical to the FXC except for reduced output.
Perhaps the Crown Jewel of the prewar Collins transmitters, the elegant 30J was the last amateur transmitter produced before Collins restricted for the war effort. The 30J was a general purpose transmitter “designed for general applications such as police service, aeronautical ground stations, or general purpose point-to-point communications where service is intermittent.” It was advertised in November 1937 QST.

- 40% more powerful than the 30FXC
- RCA suit resolved. Returned to more mainstream tubes
RCA, AT&T, Westinghouse and others (known as the “Radio Trust”) sued Collins over its use of certain circuits which employed patents owned by this trust. These patents had been earlier purchased from DeForest. Also at issue was the basic DeForest triode oscillator circuit patent controlled by RCA.

As a response, Collins partnered with Amperex to produce and brand its own tubes which employed a novel grid structure. The workaround on the critical oscillator patent was for Art Collins to secure the patent rights from Dr. Robert Goddard (liquid fuel rocket fame) who received a patent for the unusual grid located outside the vacuum tube. Branded as the C100A. Fences mended in late 1938 to 1939.
The company's first major success was not long in coming. In 1933 Admiral Richard Byrd and CBS Radio selected the fledgling Collins Radio Company—by then located in a factory and employing eight people—to produce radio transmitters for Byrd's historic expedition to Antarctica. The successful broadcast of voices from Byrd's flagship thrilled American listeners and catapulted Collins's young company into the national spotlight. Amateur and commercial radio users around the world began buying Collins Radio equipment. Collins was 24 years old.
Byrd Expedition Hurls Collins Into National Spotlight
January 1934 - Antarctica – “Little America”

The 2nd Byrd Expedition II Soils With A Complete Collins Short Wave Broadcasting Station Aboard!

One of the most ambitious feats of radio communication which has ever been attempted is now being carried out in connection with the Byrd Antarctic Expedition II which sailed from Boston on October 11, 1933, and is now well along toward its goal — Little America in the Antarctic. Radio men are familiar with the important part short-wave radio has played in maintaining contact with previous polar expeditions. On Byrd’s and McMillan’s previous trips to the North Pole and on Byrd’s last journey to the South Pole a few radio amateurs handled thousands of words of personal messages and press releases direct from these far corners of the globe. Up to now, short-wave radio telegraph alone has been used because of the tremendous distance which it was necessary to cover with relatively low-powered transmitters. But, in the last few years the advancement in the art of short-wave radio telephony has been so great that the present Byrd Expedition decided not only to carry short-wave telegraph equipment but also to transmit by radio telephone word-by-word broadcasts of their thrilling undertakings.
2nd Byrd Expedition Hurls Collins Into National Spotlight
January 1934 - Antarctica – “Little America”
C7 51 EXPED RADIO#

SS JACOB RUPPERT VIA MACKAY RADIO SAYVILLE NY 27 NFT

MR ARTHUR A COLLINS=
CEDARAPIDS IOWA#

YOUR TWENTY 3 TRANSMITTER HAS BEEN OPERATING EXCELLENTLY FOR OUR BROADCASTS STOP AT OUR PRESENT LOCATION 6000 MILES FROM NEW YORK WITH GOOD ATMOSPHERIC CONDITIONS SIGNALS ARE RECEIVED WELL IN NEW YORK AND SAN FRANCISCO STOP THE PERFORMANCE OF THE TRANSMITTER HAS LEFT LITTLE TO BE DESIRED=
R E BYRD.
Collins Transmitter Installed in Enterprise – 1934

- First known airborne application of a Collins radio.

- Pictured is the Goodyear blimp Enterprise in 1935.
Dear Mr. Collins:

I am sending you, under separate cover, a photograph of amateur station W2GOX and a sample of the daily log of the station.

The Collins 300A Transmitter has been giving excellent satisfaction and the results obtained have far surpassed my expectations. The note is always reported T-9 and the signal is frequently reported R-9 in Europe.

The sample log shows the high percentage of DX calls actually worked and gives some idea of the range of the signal, but can give but little idea of the real pleasure and many valued friendships which the transmitter has brought me.

With sincere wishes for your continued success, I am

Very truly yours

J. E. Preston
W6DZH Pasadena California - Collins 150B with 7D Speech Amplifier and 5A Condenser Microphone.

Caption:
“The new equipment at W6DZH is getting a strenuous workout this winter on 20 meter phone and 40 meter CW.”
Early Collins Station X1G - Mexico City – 1930’s
Collins Radio Co. in the 1940’s
Collins Main Plant in Cedar Rapids, Iowa - 1940
Dec. 7, 1941 “changed the game... **one minute**, literally, Collins was a major commercial and broadcast transmitter manufacturer with 500 employees, 30 or more models, and $2.1 million in sales. **The next minute all commercial production unrelated to the war effort was shut down by an act of Congress.** But Collins was ready!” They had a large manufacturing facility and many technological innovations such as the Auto-Tune, Pi Network, and reliable/durable construction that made the equipment perfect for the armed services.
<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Years of Mfg.</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCS 5, 7 &amp; 12</td>
<td>12/25 W (AM/CW) 1.5-12 MC + 4 Xtal Ch. (18Q-3) Xmtrs and Rcvrs f/ PT Boat, LCI &amp; GATO Sub Comm. Based Upon 51Q (Rec) and 50Q (Xmtr)</td>
<td>1941-1944</td>
<td>34,893 All Manuf.</td>
</tr>
<tr>
<td>AH/ARD-3</td>
<td>ADF Receiver for Canadian Lancaster Contract</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATC</td>
<td>100 Watt HF 11 Channel Autotune Xmtr (17H-2)</td>
<td>1941-1945</td>
<td>25,896 Total</td>
</tr>
<tr>
<td>T-47/ART-13</td>
<td>- - - Same - - -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AH/ART-13A</td>
<td>- - - Same - - - Included Low Frequency Osc. Also Manufactured by Subcontractors</td>
<td></td>
<td>90,000</td>
</tr>
<tr>
<td>AH/ARR-15</td>
<td>HF Receiver Airborne (51H-3 - Matched to ART-13)</td>
<td>1945</td>
<td></td>
</tr>
<tr>
<td>AH/ARC-2</td>
<td>HF Airborn Autotune Transceiver</td>
<td>1944-1945</td>
<td></td>
</tr>
<tr>
<td>TCB</td>
<td>150 W 10 Chan. Xtal Control 1.5-12 mc. AM/MCW/CW</td>
<td></td>
<td></td>
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## Collins List #2 of WW2 Communications Radios

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<tr>
<td>TCB</td>
<td>150 W 10 Chan. Xtal Control 1.5-12 mc. AM/MCW/CW</td>
<td></td>
</tr>
<tr>
<td>TCC</td>
<td>1 kW 10 Channel + Manual Tune HF 2-18 mc. Similar to 231C prewar commercial transmitter</td>
<td></td>
</tr>
<tr>
<td>TCZ</td>
<td>Shipboard &amp; Ground 115 Vac version of ART-13</td>
<td>1942-1945</td>
</tr>
</tbody>
</table>
| TDH-1 thru 4 | Auto tune – 231D  
(TDH-1) 3 kW AM 5 kW CW for 2-18 mc. | 1941-1946 |
| TDO    | 300 AM /500W CW Autotune (16F-8)  
2-18 mc.  
Signal Corp Contract nomenclature BC-460D | 1941-1945 |
| DAB 1 - 3 | Wirkler HF Direction Finding Secret Project  
Anti-Submarine DF Capability | > 100 |
| MBF    | 3 watt UHF (60-80 mc) AM Ship to Ship/Shore                                | 1944-45 | > 2162 |
| BC-401-A | RA-30-A (Based on 231B Model )  
400 W Dual C100D PA                          | 1942    |
South Africa gave Collins its largest contract to that time ... 100 of the 18M transmitter and receiver station at the start of the war in 1939.
“This is the ubiquitous Collins World War II transmitter. Derived from the original commercial aircraft line of Collins AutoTune transmitters of the 17D prewar family, this ruggedized and beautifully designed 100 watt HF transmitter was, and still is, the **pride of Collins Radio**. It flew in many aircraft ranging from heavy bombers down to multi-seat fighter bombers and eventually into some of the larger single engine/single seat fighters like the P-47 Thunderbolt and the P-38 Lightning.”
Collins AN/ART 13 Transmitter with AutoTune

video
Collins AutoTune

AUTOTUNE – “Proved to be one of the most significant developments in the success of Collins Radio Company.” In the initial stages of equipping aircraft with radios was changing the many channels needed for communication. Each new frequency required retuning. Braniff for instance didn’t want to pay for extra radio ops to tune the radios. Collins responded to this need with the mechanical AutoTune function. It helped bring an Allied victory in WWII.
Radio operator and historian Jim B. Smith remembers this experience:

I sat down in my swivel seat, and studied the equipment. It was all familiar to me except the new Collins' transmitter. Instead of having to change coils for certain frequencies as we did in radio school (the radio operators had to change frequency coils on B-17's and some early B-29's), these B-29's featured the new Collins' transmitter which gave the radio operator the capability of presetting 10 frequencies.
Can you identify these familiar shapes?

BC-348
The Signal Corps BC-348Q is a WW II vintage U S Army Air Corps receiver.
Collins ART-13 on P2V-5 Neptune Patrol Bomber

“This is a rare photo of a P2V-5 Neptune patrol bomber RADIO ROOM with AM/CW ART-13 transmitter with two ARR-15 receivers.”
Ted Hunter watching over the humidity testing of an early version of the ART-13 with AutoTune. He was the “father” of the Permeability Tuned Oscillator (PTO) that made Collins famous. (more to come on the PTO)
PROBLEM: Collins wanted to create a more stable VFO
SOLUTION: Permeability Tuned Oscillator
ENGINEER: Ted Hunter

Collins referred to their VFO as a Permeability Tuned Oscillator or PTO. The PTO circuit uses a **variable inductance for tuning and is essentially a rod of ferrite that can be screwed in and out of a fixed tuning coil.** Some of the early automobile radios used the same tuning which saved space and provided a rugged and reliable tuning circuit in minimum space as well as cheaper components utilized during production.
A PTO Assembly. Note the logarithmic spacing of the coil windings on the red cylinder in the center.

The PTO, invented at Collins under the leadership of Ted Hunter, was first introduced on the ART-13 and quickly became the standard in linear tuning devices until frequency synthesizing circuits became practical decades later.
Collins Permeability Tuned Oscillator - 1945

Diagram showing internal components:
- End Point Corrector Coil
- Tuning Coil
- Tuning Core
- Tuning Shaft
- Dehydrator Salt
- Sealing Gasket
- Tuning Capacitors
- Linear Cam
- Antibacklash Cam Follower
The TCS was designed by Collins and used, along with its matching transmitter and a power supply, during World War II on LST landing craft, P-T boats, and a variety of other smaller boats as well as on-shore applications.
Collins Transmitter Broadcast Japanese Surrender to the World from Aboard the USS Missouri
“High overall operating efficiency is attained by the use of tetrode and beam power tubes throughout the equipment, where applicable, and by the use of Class B, high level, amplitude modulation. A power input of 375 watts phone or 500 watts CW is possible on all bands. A speech clipper is incorporated in the audio section so that sideband power can be greatly increased without over-modulation.”
Collins promotional text about the 310’s - “The Collins PTO (permeability tuned oscillator) exciters give you not only the flexibility and convenience of variable frequency, but also the accurate calibration and high stability inherent in the Collins 70E-8A-PTO.” - Ran 40 watts
Collins RESNATRON – WW2

Engineers from the Collins vacuum tube lab used Salisbury’s 1938 Resnatron principle to develop a high output amplifier tube to work at 350 to 650 MHZ. It was used to jam airborne interceptor radar equipment which was carried by German night fighters over the English Channel.

After the war, Collins adapted the Resnatron for TV broadcasting.
“The high energy (particle accelerator) machines were regarded as holding great prospects in the field of medicine for cancer therapy and in the field of energy for development of atomic power sources.” There were many such devices, but all were hand-made without any standards of performance. The job of producing them “had to be done with the skills of a private concern rather than ... the universities. Collins only competitor was GE.

Two 250 ton exciter coils.

Control room
Collins Radio Co. in the 1950’s
Collins – KW-1 Transmitter – 1950 - (John Ellis – QST)

COLLINS PROMOTIONAL TEXT - “The KW-1 is a vfo controlled, band-switching, gang tuned, phone and cw transmitter. Its input is a full 1000 watts on the 80, 40, 20, 15, 11, and 10 meter bands and 500 watts on the 160 meter band. The entire transmitter together with its power supply is enclosed in a handsome grey, wrinkle-finish cabinet.”
The AN/ARC-27 is capable of transmitting and receiving on any one of 1750 channels, spaced 100 kHz, within the frequency range of 225.0 to 399.9 MHz.
"Art Collins rather liked this picture and used it to produce a QSL card. These were the last AM amateur products produced by Collins Radio before entering the single sideband era."

“Shown left to right: 32V-3 transmitter, 312A-1 speaker/station control, 75A-3 receiver, and KW-1 transmitter behind Art.”
Collins 32V3 Transmitter – 1951

- VFO gang-tuned band switching
- 150 w input on cw, 120 w input on phone
- 70E-8A PTO in 1600-2000 KHZ
- Covers 80 through 10 meters
- Cabinet identical to the 75A-1 receiver to make a complete desktop station.
Collins promotional text about the 75A1 - “Collins engineers designed a receiver for the amateur which solves the reception problems of the modern amateur better than any other receiver. In addition to superb selectivity and stability, the 75A receiver has a sensitivity which satisfies the most critical of DX hounds.”
Collins 75A2 Receiver - 1950

- 1500 KHz to 30 MHz.
- Receives CW, MCW, AM phone
- Provisions for Narrow Band Frequency Modulation Detector and a crystal calibrator
- Double-conversion superheterodyne
- Stability achieved with quartz crystals and sealed PTO
The 75A-3 also features excellent stability, sensitivity, and dial accuracy. The **Collins mechanical filter**, a new and radically different of achieving selectivity in communication receivers, use **mechanically resonant elements** to produce a selectivity curve having a flat “nose” for full SIDEBAND response and steep, almost vertical skirts for rejection of adjacent channel interference.”
Collins 75A-4 Receiver – 1955 – New Mechanical Filter - SSB

FROM COLLINS PROMOTIONAL TEXT - Collins 75A-4 receiver is designed expressly for amateur operation on seven HF bands – 160, 80, 40, 20, 15, 11, and 10 meters. The receiver retains the time-proven features of the earlier 75A series: excellent image rejection, precise and stable PTO, crystal controlled injection oscillator, and the ideal selectivity of the Collins mechanical filters. The new 75A-4 assures best SSB reception in addition to conventional CW and AM.
Collins Was First to Produce Mechanical Filters in Volume

“The filter is a mechanically resonant device which receives electrical energy, converts it into mechanical vibration, filters out unwanted frequencies, then converts the mechanical vibration back into electrical energy at the output.

By varying the mechanical coupling between the discs, i.e., making the coupling rods larger or smaller, the bandwidth of the filter is varied.”
As more and more communications equipment designs have adopted digital signal processing techniques, Rockwell Collins has announced that it will stop manufacturing its renowned mechanical filters. It did not provide a specific date.

“Over the past several years, we have seen a dramatic reduction in demand for narrowband analog filters,” the company said on its website. “Due to this and other economic reasons, [Rockwell Collins] Filter Products will be discontinuing its mechanical filter products in the near future.”
The most advanced design features ever offered in an amateur transmitter... unprecedented compactness is achieved without crowding, the exciter and RF power amplifier are housed in a single receiver-size cabinet which can be placed on the operating desk or mounted on the power supply cabinet.
Several TVARC members had these and sold them – Don Crosby and John Ellis
Collins “Gold Dust Twins” Accessories

- Directional wattmeter (302C1 and 2)
- Antenna tuner (180S-1)
- Noise blanker (136C-1)
- Gear reduction tuning knob (307E-1)
- Speaker (312A-1)
- Phone patch (189A-2)
- Low pass filter (35C-2)
- Mechanical filters (F455J series)
**SAC PROBLEM** - Unable to Seamlessly Connect all SAC Aircraft and Land Bases around the world via HF.

**SAC SOLUTION** - Collins, LeMay, and Griswold worked together to develop airborne SSB system

(Rich referred to this)

LeMay, Collins

Griswold
Under Griswold’s command, the plane flew from Offutt AFB to Great Falls Montana, to Fairbanks and Anchorage in Alaska, to Adak in the Aleutian Islands chain, to Tokyo, to Okinawa, then back eastward across the Pacific to Guam, Kwajalein, Honolulu, Travis AFB in California and back to Offutt.

“In the biography of Lemay entitled ‘Iron Eagle’, Author Thomas Coffey quoted the general as saying about sideband: “It was so much better than the standard stuff we had, there was no comparison.”
“Despite virtually continuous contact with the US from Alaska to Japan and points in between which never had been achieved with conventional HF, the Air Force communication experts still would not concede that tests using amateur radio proved conclusive.”

A second test was needed and succeeded.
Collins 30K-5 Commercial Transmitter

“This 250 watt commercial AM transmitter was a brother of the famous 30K-1 amateur AM transmitter. This rig features beautiful audio, the option of using audio clipping, and dual 75THs modulating a 4-125 driven by an 807. The 30K-5 is a two channel transmitter.”
“The Collins 51J-4 Receiver is designed for communication applications where stability and dial accuracy of the highest order are the prime requisites. Under normal operating conditions, the receiver operates in the range of 540 kc to 30.5 mc with a total setting error and **drift of less than 1 kc at any frequency within its range**. This receiver incorporates the new mechanical filter in the intermediate frequency range to obtain the desirable rectangular-shaped passband.
Collins 618S series – HF Airborne Transceiver with AutoTune

“It featured 144 crystal channels using a signal crystal for both receive and transmit and was AM and CW only.”

- Frequency Range: 2-25 MHz in Four Bands – 100 Watts
- On airliners of the day such as the DC-7
FROM COLLINS SIGNAL MAGAZINE
– Spring 1953

“This installation of Collins Integrated Flight system (IFS) is on the instrument panel of the personal Super DC-3 airplane of Donald W. Douglass, president of Douglas Aircraft Co., Inc.

Top middle instrument is Approach Horizon; Course Indicator is directly under.
Around the end of WWII, in the golden age of analog designs, Collins set new standards for tuning accuracy and stability in communication equipment, culminated since the early ‘1950s in the introduction of digital mechanic readout sets, as the R-390. **Specs of these sets were simply exceptional, with overall accuracy and stability figures unsurpassed until the introduction of digital frequency synthesizers.**
“Collins gained attention of the news media in April, 1950, when the *New York Times* reported on the Transhorizon experiments being conducted by Collins. ... The new method appears to make obsolete the generally accepted theory that signals transmitted on very high frequencies, such as those used by video, are limited to line of site.”
Collins Transhorizon For DEW Line - Early Warning System

Collins Radio Company

White Alice – DEW Line

- Authorized in 1954 – UHF Tropospheric for Communication & Data
- 52 Initial Sites – Installed 1955 – 1957 – Expanded to 71 -- Updates
- Wideband System – 132 FM Channels – About 900 Mhz
- Various Configurations – Minimum 2 Receive & One Transmit Antennas, 1 Diversity Receiver & 1 Transmitter System Per Site
  -- AN/FRC-45 – 1-kw Transmitter
  -- AN/FRC-47 – 10-kw Transmitter
  -- 60 Foot Billboard Antenna
  -- AN/FRA-45 30 Foot Parabolic Antenna
  -- 50G-1 Diversity Receiver

Collins Only Supplier in 1950s
Complete Military & Commercial Transhorizon Systems

Army Mobile Tropospheric
Commercial – Transportation, Telephone, & Petroleum Communication & Data Terminals

Boswell Bay, AK – First Commissioned
Last Decommissioned

John Designed All DEW Line Communication Antennas
Collins Moon Bounce Research - 1951

Collins Radio Company – Moon

- Art Collins – Moon to Reflect Signals from His Amateur Station
- Set Up Team – Irv Gerks, John Shanklin, Leon Griswold
- Faced the East Horizon
- Iowa Electric Power Arrangement
- Heated Hanger Sheet Metal
- 2–1/2 Seconds – 500,000 Miles to CRPL
- 800 Ground Miles to Sterling, VA

1st Successful UHF Long Telegraphic Message
November 8, 1951

“What Hath God Wrought”

- 75 Ft Long Tapered Wave Guide Horn
- 20 X 20 Ft Opening
- Metallic Wire Mesh
- 418 MHz (72-cm) Coded Signal
- 20–kilowatt Transmitter – Collins Liquid Cooled Resatron Tube
- 26.3 dbi of Gain – 10 Megawatts of EIRP

“Chicken Horn”
“The ship’s navigator can find his position just as if he had an assistant watching the sun through an ordinary extant. No cloudy weather gets in the way of the radio sextant, nor can an enemy jam the radio impulses (as is possible with other radio aids to navigation, such as Loran.”
Collins Project Mercury Space Communications

Project Mercury

Schedule
High Priority – DX Rating

Award Jan 1959
$ 4.0 Million

1st Delivery
June 1959

714U-1 Voice Control Panel

50W-1A UHF FM Command Receiver (2)
406–549 Mhz

618H-1 UHF Transmitter – Receiver (2)
Main Voice, Secure, Rescue – 296.8 Mhz

618V-1 HF Transmitter – Receiver (2),
Voice Backup, Rescue – 15.016 Mhz

Collins Responsibilities

Voice
Telemetry
Rescue
Tracking
Command

Valuable Experience
System
Schedule
Subcontract
Cost Mgt

Existing Technology
14 Systems
30 Items/ System
10 Subcontractors
Bench Test Sets
Signal – Winter 1963

Center - Collins HF log periodic antenna overlooks Malabar transmitter site for all AMR to beam down range for voice communication.
Art Collins took it mobile on his honeymoon! Ask about related articles on transceiver stations in a box radios.

- Covers 14-30 MHz with an input of 175 watts PEP or SSB.
- Uses VOX for break-in CW
- Bands covered in 100 KHz increments based on 10 injector crystals
- Used in U2 spy planes and many other military uses
Collins KWM-1 Transceiver Accessories - 1957

- A – Speaker
- B – Speaker console with RF wattmeter
- C - DC power supply
- D - Mobile mount
- E – DX conversion adapter (separate receiver and transmitter functions)
In 1931 Lippisch developed the Lippisch Delta I ... the *world's first delta wing aircraft*.

“After WW2, the US “raced to grab as many of the highly skilled German scientists as possible.” Dr. Lippisch was one of the 50 German scientists brought to the US. *He joined Collins* in February 1950, as head of aero dynamical research. It was here that he developed the ‘Aerodyne’, a wingless aircraft.” *This model never flew except in a wind tunnel.*
Collins Radio Co. in the 1960’s
Photo of James Bond in the movie Goldfinger about to climb aboard a Lockheed Jet Star L-329 sporting the Collins Radio logo on the blade antenna.
Collins Promotional Van – 1960’s
“The Collins S-Line was perhaps the most successful product line in history, spanning over two decades.

The S-Line replaced the A-Line “Golddust Twins” (the 75A-4/KWS-1) in 1958 with the introduction of the 75S-1 and the 32S-1. Inspired by Leica camera, Art Collins wanted the S-Line front panel backgrounds to have a leather-like finish. The visually pleasing aesthetics combined with a simplified control layout and a sloping cabinet design made the S-line very comfortable to use and helped to make it an instant success.”
Collins 32S-3 Transmitter – 1963
Improved 32S-1 and S-2 by adding CW calibrate/spotting control and deletion of spurious CW signals

• Covers 3.4 to 30 MHz with a power input of 175 watts PEP or 160 on watts on CW.

• Dials and controls are “human-engineered for operational efficiency.
COLLINS TEXT – “The Collins 62S-1 permits you to enjoy operation on either 6 or 2 meters by simply snapping a switch. No cable patching is required. It can be used in any operational mode, as determined by the companion receiver and transmitter. Power input is 160 watts.

Reflecting Collins emphasis on system engineering and flexibility in amateur equipment, the 62S-1 is designed for use with the S-Line, KWM-1 and KWM-2. It converts signals to 14.0 to 14.2 MHz.”
COLLINS TEXT – “The Collins 75S-3 is a versatile receiver with exceptionally sharp selectivity and operation in any of three modes – SSB, CW, and RTTY. A mechanical filter is optional.

Transceiver operation is achieved when used with the companion 32S-3 transmitter. Receiver PTO then controls the transmitting frequency.
Collins S-Line 312B-4 Console and 312B-5 VFO

STATION CONSOLE – directional coupler, wattmeter, speaker, phone patch, interconnections.

SEPARATE VFO
Collins S-Line Accessories

- Antenna Tuner
- Speaker
- RF Wattmeter / SWR Meter
- Novice Crystal Switch
- Dummy Load
- Rack Mount
“The KWM-2/2A was unmatched in performance and dependability for mobile and fixed station applications. The transceiver's power input is 175 watts PEP on SSB or 160 watts on CW. The KWM-2A utilizes an additional crystal board.” Used for military and ham applications. Operates on 80 to 10 meters.
Collins KWM-2 and KWM2-A Accessories

Noise Blanker
Carrying Case
Dipole Antenna
Mobile Power Supply
Mobile Mounts
The Collins 30S-1 is a single final tube (Eimac 4CX1000A), grounded grid linear amplifier with frequency coverage consistent with the 32S-1 and 75S-1. It provides full legal power input for SSB (1kW average) or 1kw input for CW, requiring 70 to 100 watts excitation. By retuning the input coils as necessary other frequencies are available in the range of 3.5-5 and 6.5-30 MHz.
Collins 30-L1 Linear Amplifier - 1961

Collins PROMOTIONAL TEXT - “The Collins 30L-1 has 1000 watts PEP power input on SSB and 1000 watts average on CW on 80, 40, 20, 15 and 10 meters. Uses TWO FINALS (811A) Drive power is 70 to 100 watts for full power output. RF connection is N type.”

(Ask Don Crosby about his)
Collins S-Line Permeability Tuned Oscillator – 70K2
Collins Former S-Line Engineers/ Techs, and Equipment – 1990’s
FALL, 1963 - Collins built the largest portable complex in the world at that time. It consisted of several trailers that provided communication support for the tracking of the Atlantic Missile Range launches and space tracking programs such as the Mercury astronaut project and military spacecraft operations.

It combined UHF, VHF, and HF radio communications.
“Communication and data equipment on the spacecraft will also be provided by Collins. Among this equipment will be S-band transceivers, VHF transceivers, intercommunication and associated equipment. The CM and LEM can communicate with each other via the low power VHF radios.

Frequencies:
• Uplink – earth to CM (2100 MHz)
• Downlink – CM to earth (2300 MHz)

Phase modulation and frequency modulation will be employed.”
FORMER SUBMARINER - “The URC-32 was the fleet’s mainstay comm rig once SSB replaced AM and all the older boat anchor receivers and huge transmitters.

The ATU was usually mounted at the base of the supplied 35' whip antenna and controlled from the main rack. It ran 500W PEP output on SSB to a pair of 4CX250R/7580's in the 2-30 MHz range.

Once hams got permission to operate aboard ship I ran hundreds of phone patches but since it was the ships primary rig there was no general hamming. I had to use the old CW/AM gear in Radio 2 for that.”

Carl posted the above at http://www.antiqueradios.com/forums/viewtopic.php?t=90350
ENCOUNTER 1 – 1963

• “Collins needed larger scale computers for its manufacturing, engineering, marketing, finance, personnel, and other functions.” Collins sought capacity with other companies who had time to sell on their computers. Collins got that he needed by hiring Ross Perot’s Electronic Data Systems in Dallas ... and Ross *himself* was the sales person

• Perot said in 1992 when he was a presidential candidate, “It took me 78 sales calls to make my first sale ... though in, all of places, Cedar Rapids Iowa. I used that $100,000 to hire more systems engineers.”
ENCOUNTER 2 - 1969

• Art Collins wanted his company to pursue the development of computer systems (“C-System”)

• Collins announced in 1968 that it would enter the computer field with its C-8500. His goal was not to compete with IBM, but to “combine processing functions with high speed, high volume data communications.”
The Perot Saga (3) – 1960’S

• 1968 was a record sales year ($447 million). Arthur thought these high sales justified the course he was taking with the highly costly development of the C-System of computers.

• In 1969 a torrent of troubles settles on Collins Radio. Sales dropped to $440 million and the price of Collins stock began to fall. Superficial and explicable reasons for the fall:
  1) Military spending was down for R and D, avionics and communication equipment. Pentagon priority was on guns and bombs for the Vietnam war.
  2) Downturn in US economy
  3) Reduction in new business for the aviation industry. This hit Collins hard as airlines cut orders for new planes.
  4) Apollo space program reached its goal of putting men on the moon.
The Perot Saga (4) – 1960’s

- Collins was accustomed to fluctuating business cycles with its two main sources of sales: military and aviation ... “but never before in the company’s history had Collins Radio been burdened with the level of bank loans it held in 1969: over $100 million” with Collins pressing forward on the expensive C-system with a “damn the torpedoes, full speed ahead attitude regarding costs.”

- Then in early 1969, Ross Perot attempted a takeover of Collins to merge it with his fledgling Electronic Data Systems.

- “The Perot attempt failed, for a variety of reasons.” The bankers looked upon EDS as a much smaller firm with inflated stock values, in no way qualified for what Perot wanted to do, and saw no advantages for Collins in his proposal. Also, there were bank loans, which Perot would have to payoff or negotiate.”
Collins Radio Co. in the 1970’s
When the bankers helped prevent Perot’s takeover of Collins, they delved deeper into the company’s books and what was happening inside the firm. *Bankers and analysts thought that “Collins Radio was not a healthy organization from a financial viewpoint. They felt he spent too large a portion of the company’s funds on R&D to ever show consistent profits and dividends.* They were concerned about the volatile earnings record and one-man control, which as one put it, *is not a lasting base on which to build an organization.*

Once Arthur Collins accepted that he needed outside help, a search began for a financial partner or a relationship. They started with Honeywell and Schlumberger. *His goal “was to find a suitor who would provide financing to allow him to complete the C-system of computer, data, and communication connections ... and still leave him in charge.”*

• Sales declined further in 1970 to $349 million with a drop in stock of 80% in two years. Over this two year period from 1969 to 1971, Collins employment dropped 40%. The C-system was primarily at fault for this decline.

• TRW began negotiations with Collins Radio in March 1971, but nothing solid developed.

• In May 1971, a final agreement was made with North American Rockwell: $35 million investment, NR had right to elect majority of Collins Radio’s board members.

(Note! Chuck Kilgore, N2GXK, commends Rockwell-Collins for the excellent research they completed from him while working for the FAA. Ask him about it.)
“The transceiver basically covers the 1.8 to 30 MHz range in 10 KHz steps with a four-speed tuning capability on receiver and nominally only the 160-10 meter amateur bands on transmit. WARC bands are provided for by a simple modification. For its power class as a nominal 100 watt output transceiver, it is several times large and heavier than other transceivers. It contains a speaker, power supply, second VFO, and space for a host of accessory items such a unique type of new speech processor.”
“The 451-S is a professional single sideband (SSB) communications receiver that offers reception of upper and lower sideband, CW, AM, or FSK signals over the frequency range of 0.2 to 30 MHz. The unit is of solid-state design... and uses single know tuning to cover the entire frequency range without band switching. A high resolution synthesizer with microprocessor controls four tuning rates down to 10 Hz increments.”
“Introducing Digital Signal Processing techniques to the HF communications market. The extensive use of digital circuitry for signal processing and control affords the operator convenient command of the LF, MF, and HF spectrum. Tuning is accomplished by any of four methods: (1) The numeric keypad may be used for selecting frequency; (2) User preset channels may be recalled; (3) The rate selectable tuning knob may be used; or (4) Tuning may be via the digital remote control interface. A simple user code allows multiple receivers to be controlled from a standard video display unit.”
“The 651S-1 receiver series was developed and produced by Collins in late 1970 to meet the need for a remotely or locally controlled state-of-the art, general purpose HF receiver capable of reproducibility in high volume and at an economical cost. It was design using modular, solid-state construction.”
PROMOTIONAL TEXT - “Like the HF-8050 it is triple conversion and 5 additional mechanical filters can be installed in the sister board attached to the Channel A-IF board. The 815S-1 features “continuous” rate sensitive tuning and phase-locked digital variable bfo. Slide-out chassis and plug-in circuit cards provided easy access to maintenance.”
Collins Logos from CCA
Rockwell-Collins Today
United Technologies To Acquire Rockwell Collins For $30 Billion

Combination Creates Premier Aerospace Systems Supplier

- Combined business will be well-positioned to meet rapidly evolving global customer demands
- Highly complementary to existing capabilities
- Enhances innovative systems capabilities and integrated digital product offerings, including avionics, flight controls and data services
- Expected to generate cost synergies in excess of $500 million
- Anticipate acquisition to be accretive to UTC adjusted earnings per share after first full year following closing

FARMINGTON, Conn., and CEDAR RAPIDS, Iowa – September 4, 2017 – United Technologies Corp. (NYSE: UTX) ("UTC") and Rockwell Collins, Inc. (NYSE: COL) ("Rockwell Collins") today announced that they have reached a definitive agreement under which United Technologies will acquire Rockwell Collins for $140.00 per share, in cash and UTC stock.

Rockwell Collins is a leader in aviation and high-integrity solutions for commercial and military customers and is globally recognized for its leading-edge avionics, flight controls, aircraft interior and data connectivity solutions. On a 2017 pro forma basis, its estimated sales are greater than $8 billion.
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Complete Way to Review All Collins Radios and History

Rockwell Collins Museum

Early Collins Radio Co. Product Brochures

- Transmitters

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