The Radio Repair and Restoration Group at the University of Michigan

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The University of Michigan Amateur Radio Club, founded in 1913, operates from within the Electrical Engineering & Computer Science Building. Its members are active in a variety of radio-based projects that include high-altitude balloon tracking, fox hunts, weak signal propagation, tinkering in vintage vacuum tube radios and providing technical and FCC Rules assistance to various student organizations who utilize radio frequency in their projects.



RME-69 Receiver



Hallicrafters SX-28 Receiver

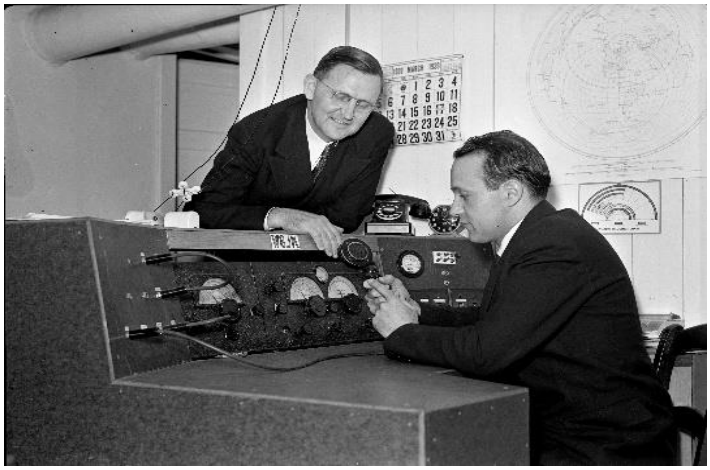
One such group, the Radio Repair and Restoration Group, came into being during 2017. The group's initial goal was to repair a Hallicrafters SX-28 receiver that was found in a storage closet. The receiver, without any owner identification, was in a state of considerable disrepair. Before commencing on any specific project, the group agreed upon adopting an overall repair protocol, which would then be applied to all units under test. This included; a) an initial general inspection to visually identify any obvious defects, b) a survey to identify all suspect paper-based capacitors (which could be shorted or leaky), and finally an inspection for frayed cloth wiring (including the power cord). This was followed by a chassis cleaning, testing the tubes, lubrication of tuning mechanisms, and identification of poor solder connections. After the preliminary checkup, AC power would be slowly increased up to mains voltage by means of a Variac and the component review would then be repeated. Use of a FLIR Instruments real-time infrared camera would then be utilized to quickly identify any overheating components, such as resistors exceeding

safety limits. It was felt that this protocol would allow for precise localization and correction of the most commonly encountered vintage radio circuit problems (typically short circuits).

In applying this procedure to the Hallicrafters radio, after identifying and replacing the electrolytic and paper capacitors, the tuning mechanism clutch was noted to be damaged and was refitted with working hardware. Subsequently, both dial settings were calibrated and finally, a shorted capacitive coupling, for the automatic volume control (AVC) amplifier grid circuit, required the introduction of an add-on capacitor.

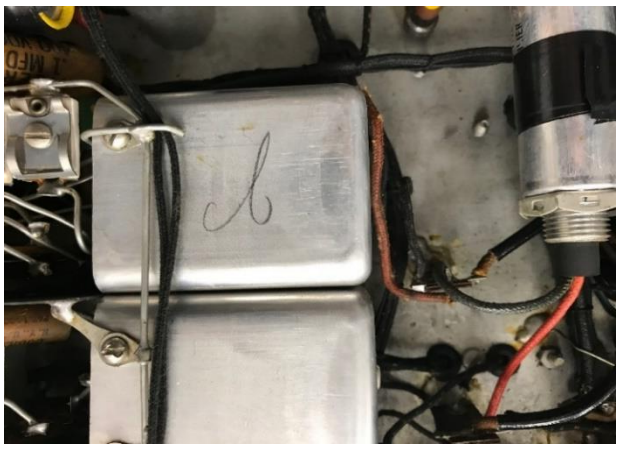
The restoration process concluded with precise frequency calibration of the local oscillator and IF center frequencies followed by RF front-end and IF alignment, all guided by the original, manufacturers, document specifications. The SX-28 was now in conformity with 1941 Department of War performance guidelines.

The second project was a **Radio Manufacturer Engineering RME-69 Receiver** original to the university's W8AXZ wireless station of the 1930's. It was reputed to have personally belonged to Professor John D. Kraus (W8JK), past club-officer and renowned antenna theorist, during his time at the University of Michigan (Tappan Hall; seated in photo operating the RME-69). The receiver had spent nearly nine decades in storage and its functional status was unknown. The owner's manual revealed unusual features like a resonator, a pull-out knob for CW monitoring, and parallel / series crystal filters. Originally, the radio controls were all un-labelled. This was intentional by the manufacturer since RME Engineers believed that a radio operator should have the knowledge to operate their radio without prompts.



Although described in other RME writings, finding the RME design team's initials on the sub-chassis was an unexpected and welcomed finding!






L-R: LM-initials unknown, CB-Clint Bowman and VDx-possibly Vern Rogers

Initially, RME-69 repairs where focused on replacing a frayed power cord and paper-capacitors. A new filter capacitor in the power supply increased plate voltage from 250 volts to over 300 volts but powering up revealed unanticipated new problems. In particular, the crystal filter selectivity-control capacitor was shorted to ground which required removing the short and adjusting a secondary trimmer, in the first IF stage in order to restore a degree of functionality to the receiver.




With these restorations completed, efforts were now directed to several, vintage, Collins KWM-2 and KWM-2A radios that were donated to the W8UM Amateur Radio Club. Unfortunately, during a two year hiatus (COVID-19 pandemic), the wall shelving holding the RME-69 gave way and the radio, in its state of "near repair", was handed a significant setback after falling nearly 5' to the floor. (Photos). This now presented additional challenges involving: replacing of a broken BFO variable capacitor, replacing a glass front panel and refitting of a splayed fine-tuning shaft. With the above completed, both RF front-end optimization and IF alignment to the radio's 465 kHz crystal frequency was performed. With the restoration

completed, this historic "Golden Age" communications receiver now exhibited the same excellent selectivity and sensitivity that the RME Engineers advertised in 1936. (Photo)

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