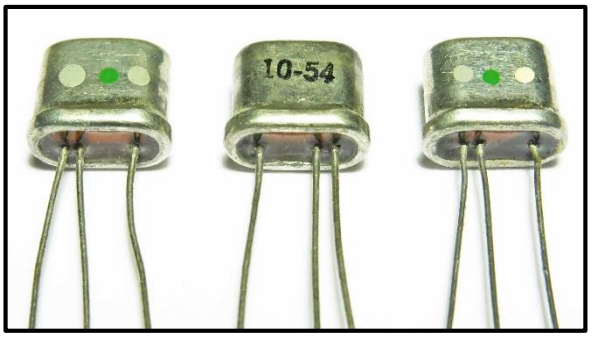
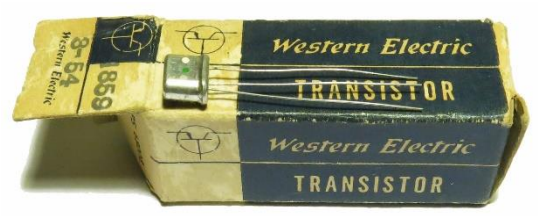
Mr. Mike Warren
TRANSISTOR MUSEUM DONATION
March 2016





Transistor Size (5/16"L X 3/16"W X 5/16"H)
Date Codes are mid 1950s
10-54 (Month 10, 1954) on top units
3-54 (Month 3, 1954) on packaged unit
Color Code IDs used for early WECO devices
(Grey, Green, Grey = 1858) above left
(Grey, Green, White = 1859) above right
Note: The 1859 has wider performance characteristics than the 1858.

Western Electric Types 1858 and 1859

TYPE
Germanium NPN Grown Junction Transistor

USAGE
Experimental Types for Voice and Carrier Frequency Telephone Equipment

DATE INTRODUCED
1953

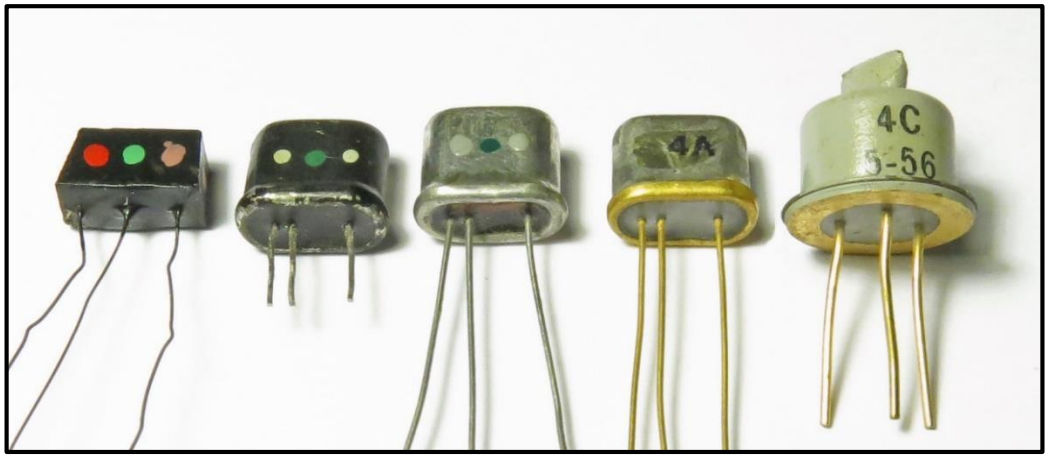
AVAILABILITY
Rare (Limited Production)

DONATION COMMENTS
"Jack, Appreciate the note. Just have a 40 year love affair with the electronic repair business. The first 35 were professional video and the last 15 I have returned to vintage audio (my start) in this business. Mike Warren, Vintage Audio"

HISTORIC NOTES

One of the first documented production uses of transistors was in the telephone carrier systems manufactured and installed by Western Electric in the 1950s. The WECO Allentown Laboratory was active in studying the widespread use of the new transistor technology that had been developed at Bell Labs. For example, the February 1958 Bell Laboratories Record publication contains the article "Transistors for Rural Telephone Systems", which documents the use of the 1858 Western Electric transistor (shown above) in an early field trial of transistors in carrier equipment. The testing was done on a system installed in 1954 in Americus Ga. The results of the testing proved largely satisfactory, with follow on design improvements required for the 1858 – this led to the development and release of the Western Electric Type 4 series of transistors, including the 4A, 4B, 4C and 4D. The 1858 and 1859 are historic transistors, developed in the early days of this technology, and were used in the first phone switching system installed as proof of concept for the use of transistors in the Bell System network.

Western Electric Types 1858 and 1859



Evolution of the 1858/1859: The first preproduction Western Electric junction transistors were developed in 1952, beginning with the 1752 (color code: violet green red) shown at far left. This plastic cased device was suitable for experimental and circuit design purposes, but did not meet reliability and performance levels required for production use. An improved metal cased hermetically sealed version, the 1858, was soon developed, with an initial black metal version, followed shortly in late 1953 with a silver model – both shown above. The 1858 was used in the field trial of the first transistorized phone system, installed in Americus Georgia in 1954/55. The 1858 performed well enough initially, but performance deteriorated over time due to contamination of the germanium surfaces. Continued improvements lead first to the Type 4A and finally to the pinch top 4B/C/D series which used an oxygen filled metal case to minimize contamination (above right). Production of the 1858 and Type 4 series was done at the Western Electric Allentown facility. The photo at top shows the transistor manufacturing area of the Allentown plant in 1954.

Western Electric Types 1858 and 1859

Transistorized Rural Carrier Trial Starts

The transistor, the revolutionary electronic device invented at the Laboratories, is the heart of a new telephone system which promises to bring more and better telephone service to the nation's rural areas—without adding more telephone lines.

The new system permits many conversations to share a pair of telephone wires without interfering with each other and can operate economically over distances as short as five miles. Other systems not using the transistor have been able to do this economically only over much longer distances.

An experimental model of the new system is now being installed for a trial in a typical farming community near Americus, Georgia, about 135 miles south of Atlanta. The Southern Bell Telephone Company is participating in the trial.

The transistor—a tiny rugged device which can do most of the things an electron tube can do but requires only minute amounts of power—has previously been used in some telephone apparatus. This is the first complete system of telephone equipment, however, which will use them.

More than 300 transistors will be used in the equipment on trial in Americus. Advantage will be taken of the lower power requirements and the reduction in size of various parts which the transistor affords. This is expected to result in cutting the over-all size of the equipment to about one-tenth of what it would be if electron tubes and their related equipment were used.

It is this reduction in size and power requirements made possible by the transistor that has enabled engineers to design a system economical for such short distances. In this system, the transistors will require so little electric power that the batteries needed to supply it will be hung on the telephone poles with the transistors.

The experimental system is being tried over one line 11½ miles in length and a second line 15 miles in length, both extending from the central office in Americus. The new system uses the "carrier" principle which permits many conversations to share a pair of wires.

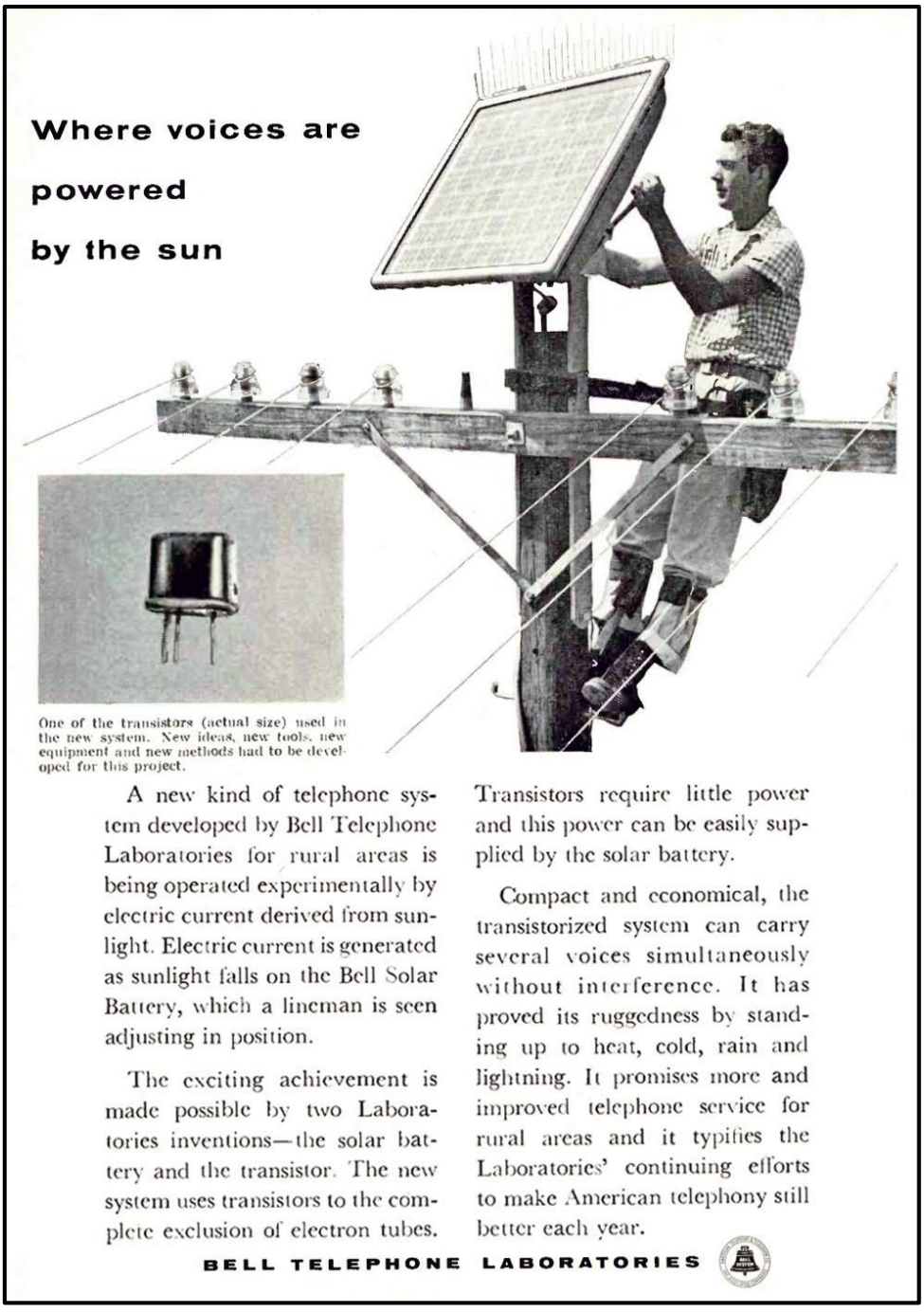
The carrier equipment on each of the lines being tested will consist of a terminal in the central office at Americus and another mounted on a pole farther out along the line. Between each of the pole-mounted terminals and the central office terminal, a number of conversations will share the use of the wire by using different frequencies. Beyond each of the terminals, the conversations which have been riding together between the carrier terminals will reach customers directly over the circuit in the ordinary way.

As an example of the small power requirements of the transistor, the carrier equipment in the trial at Americus will require for each terminal only a twentieth of an ampere or less, at 20 volts, in comparison with a power requirement 20 to 30 times as great, that would be necessary if electron tubes were used to perform similar functions.

Equipment being used for the trial consists entirely of laboratory models and will be used to obtain experience in actual service. In the final design the parts will be much more compactly packaged and they will look considerably different.

This article from the April 1954 Bell Labs Record publication provides details on the Americus Georgia phone system field trial. As noted earlier, 1858 transistors were used in this system. The insert at lower left is a commemorative paperweight from this time, with an encased 1858 transistor. Western Electric was eager to promote its achievements.

Western Electric Types 1858 and 1859



Where voices are powered by the sun

One of the transistors (actual size) used in the new system. New ideas, new tools, new equipment and new methods had to be developed for this project.

A new kind of telephone system developed by Bell Telephone Laboratories for rural areas is being operated experimentally by electric current derived from sunlight. Electric current is generated as sunlight falls on the Bell Solar Battery, which a lineman is seen adjusting in position.

The exciting achievement is made possible by two Laboratories inventions—the solar battery and the transistor. The new system uses transistors to the complete exclusion of electron tubes. Transistors require little power and this power can be easily supplied by the solar battery.

Compact and economical, the transistorized system can carry several voices simultaneously without interference. It has proved its ruggedness by standing up to heat, cold, rain and lightning. It promises more and improved telephone service for rural areas and it typifies the Laboratories' continuing efforts to make American telephony still better each year.

BELL TELEPHONE LABORATORIES

Solar Batteries and 1858 Transistors: This ad, excerpted from the January 1956 Radio Electronics magazine, illustrates two of the greatest mid-century inventions from Bell Labs – the transistor and the solar battery. Both of these historic technologies were used in the historic phone system field trial at Americus Georgia in 1954.