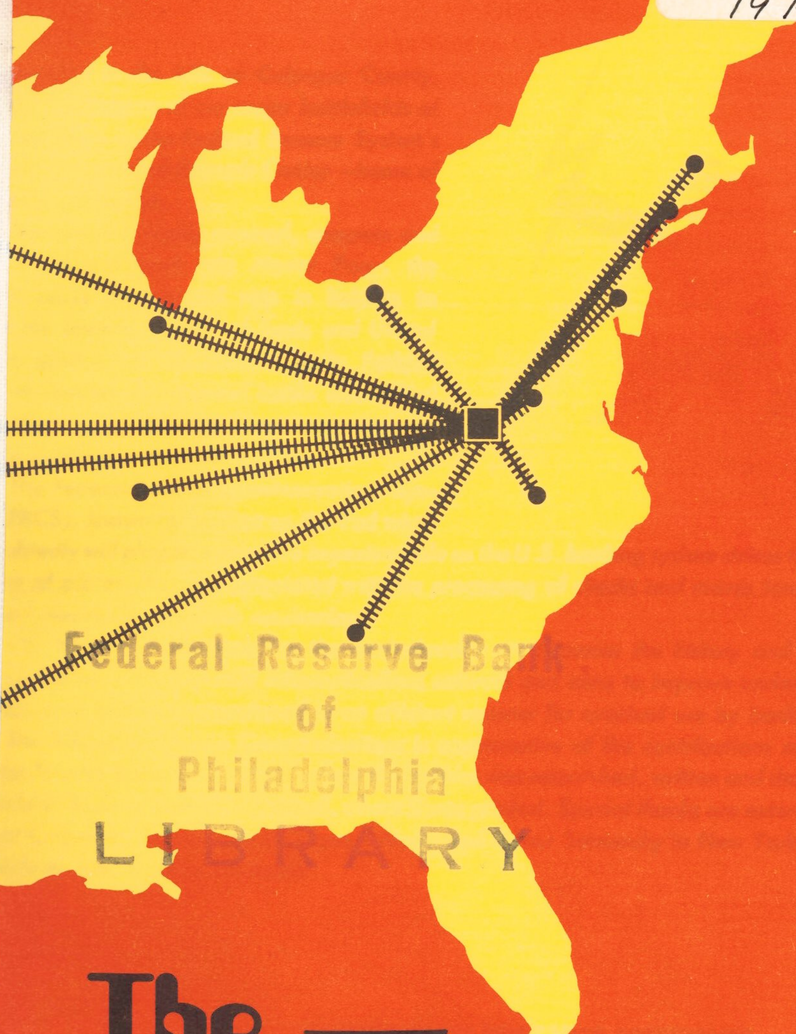




# The Culpeper Switch

THE FEDERAL RESERVE SYSTEM

*Nestled in the hills of Culpeper County, Virginia, near some of the major battlefields of the Civil War, is the Federal Reserve System's Communications and Records Center—home of the Culpeper Switch.*

*Housed in a highly secured, concrete and steel building carved into Mount Pony, the Switch plays an integral role in helping to insure the smooth transfer of funds and United States government securities among Federal Reserve member commercial banks throughout the nation—a prerequisite for a properly functioning banking and credit system.*

*The Federal Reserve Communications System (FRCS), known to bankers as the Fed wire, undoubtedly will play an even more important role as the U.S. banking system strives to reduce the billions of pieces of paper associated with the processing of checks and moves toward a more efficient electronic payments mechanism.*

*This booklet is designed for the nontechnician. It discusses the history and role of the Reserve System's 40,000-mile communications network and aims to improve understanding of why and how funds are transferred in an efficient manner for eventual use by bank customers.*

*The Subcommittee on Communications is appreciative of the contributions made by the Federal Reserve Bank of New York, where the booklet was researched, written and designed, and the Federal Reserve Bank of Richmond, where it was printed. Special thanks are extended to Dan Coli at Culpeper, Sonya Fujarski, Joseph Maile and Arthur Samansky in New York and Eloise Renner and Stan Kirks in Richmond.*

**CONFERENCE OF FIRST VICE PRESIDENTS**

**COMMITTEE ON COMMUNICATIONS AND PAYMENTS**

**SUBCOMMITTEE ON COMMUNICATIONS**

**SEPTEMBER 1975**

# The Culpeper Switch...

## THE FED'S JUNCTION . . .

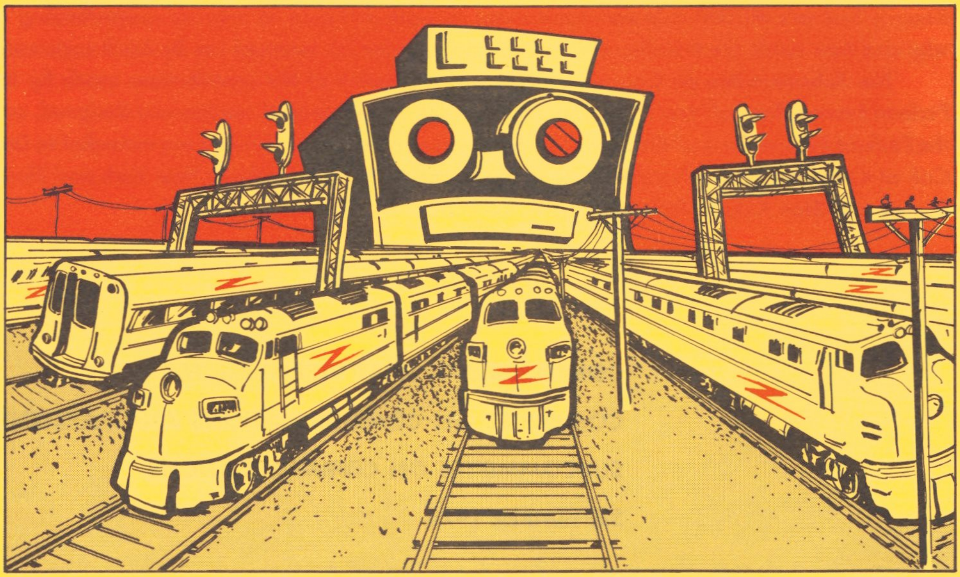
The Culpeper Switch!

The name brings to mind a railroad junction. And, in fact, the "Switch" is a junction, of sorts, but in the most modern electronic sense.

Much like the railroad junction, where trains are routed onto different tracks as they head for cities across the United States, the Federal Reserve System's Culpeper Switch currently routes onto computer "tracks" (circuits) messages transferring through the nation's commercial banking system about $30 trillion of funds and securities annually. Messages moving an average of $120 billion of funds and securities each business day, or more than $140 million every minute of the working day, pass through the high-speed computerized Switching Center.

Each of the 30,000 daily messages is flashed to Culpeper in electronically coded form. They originate in commercial banks, are sent to Reserve Banks and then are switched to other Reserve and commercial banks. The speedy transfer gives the central bank the ability to virtually instantly add to or subtract from the accounts of about 5,700 member commercial banks, giving those commercial banks, and through them, the public, almost immediate access to funds and securities.

Why this communications system exists and how it grew is the story of "The Culpeper Switch." ●



The speedy transfer of funds and securities is accomplished by the Culpeper Switch in a manner resembling the routing of trains at a railroad junction.

## BEGAN MORE THAN 60 YEARS AGO . . .

Plans to lay an imaginary roadbed of "tracks" leading from the first "Switch" began with the signing of the Federal Reserve Act by President Woodrow Wilson, December 23, 1913. In that legislation establishing the Federal Reserve System, the central banking system of the nation was given a number of responsibilities. One of those duties was to provide for an elastic currency which would result in a regular flow of money and credit throughout the nation and help create conditions for stable economic development.

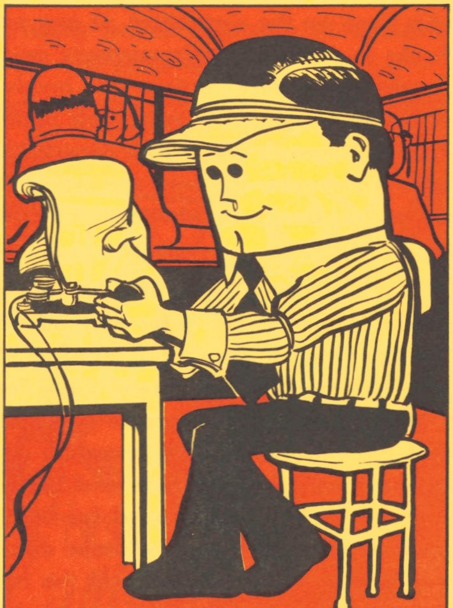
The reasons for this Congressional directive were clear. Prior to the founding of the Federal Reserve, commercial banks in small cities deposited funds with commercial banks in larger cities in order to gain interest. The medium-sized banks similarly deposited funds—their own and those held for smaller banks—in larger banks. The small and medium-sized banks counted those deposit balances as reserves against the deposits of their own customers. When pressed for funds, the demands of the small and medium-sized banks funneled into the big banks, putting considerable pressure on them.

Generally, the larger banks were able to meet these demands for funds, except when business activity was high. At those times, consumers needed large amounts of currency and borrowers needed large amounts of funds to build the plants and buy equipment necessary for producing goods and services for the public.

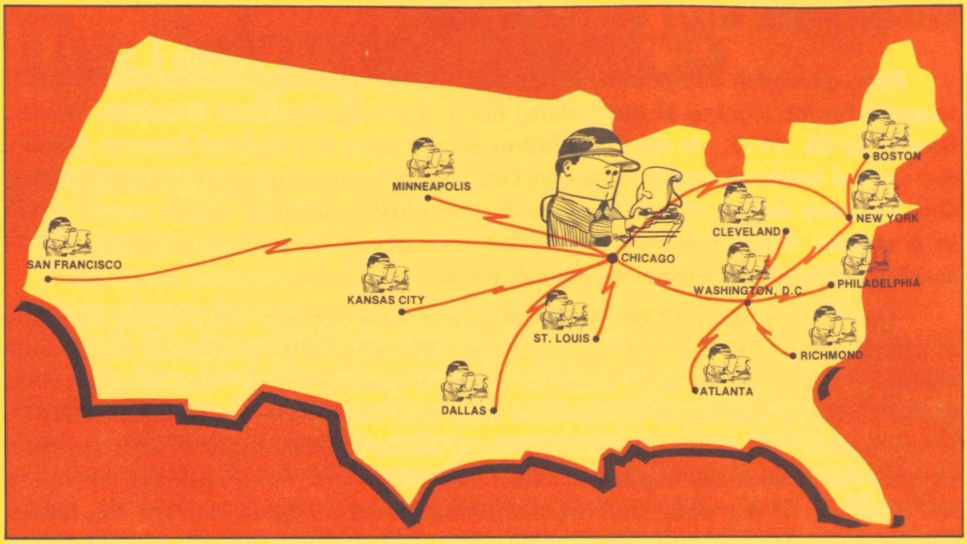
These pressures intensified during crop-moving seasons when the nation's farmers needed huge amounts of credit. The agricultural sector of the U. S. at the start of the 20th century accounted for more than 15 percent of total U. S. production, compared to less than 5 percent today.

To relieve the pressures, the larger banks were often forced to sell securities and call loans. Sometimes, the resulting chain of credit liquidations created a money crisis and the crisis in 1907 was a devastating blow to the banking system. As one bank after another was unable to reacquire its funds and thus unable to meet demands, bank doors were closed, increasing pressure on the remaining banks — big, medium and small. Bank failure followed bank failure and the economy fell into greater jeopardy.

It was this sometimes disruptive flow of money and credit that Congress directed the Reserve System to correct.



The first Federal Reserve "Switch", a Morse Code network, reduced the need for physical transportation of currency and gold by 1918.




The Chicago Fed was the Switching Center in the first network connecting the 12 Reserve Banks, the Board and the Treasury through relay points.

When the Reserve Banks and branches opened their doors, electronic communication was still in its infancy. Indeed, the first transcontinental telephone call was made in January 1915, about one year after the Reserve System began. Thus, adjustment to bank balances and the movement of funds from a commercial bank's reserve account on the east coast of the U. S. to a reserve account of a bank on the west coast, or any point in between, often required the Reserve Banks to physically ship currency and gold. Clearly, this procedure was costly, required considerable time and involved heavy risk. The only alternatives used occasionally were the telegraph facilities of Western Union Telegraph Co. and Postal Telegraph Co., which consolidated in the 1930s. But this alternative also had drawbacks, because the transmission facilities were not under control of the central bank. In addition, messages had to be sent to the transmission offices by runner.

Within a few years after its founding, the Federal Reserve already was well on its way to a far safer method of moving funds and establishing the first "Switch." In an April 1918 letter to W. P. G. Harding, a member of the original Board of the Reserve System, three Federal Reserve Bank officials recommended that, ". . . a private telegraph wire system be installed between all Reserve Banks and the Federal Reserve Board in accordance with the arrangement proposed by the American Telephone and Telegraph Co. (AT&T) . . ." Further, the officials concluded, "The urgent need for this service is so manifest that your committee recommends installment without delay, in order that the Treasury Department, the Federal Reserve Board and the Federal Reserve Banks may have the benefit thereof during the Third Liberty Loan drive . . .", in which Americans lent funds to the U. S. government by purchasing government bonds.

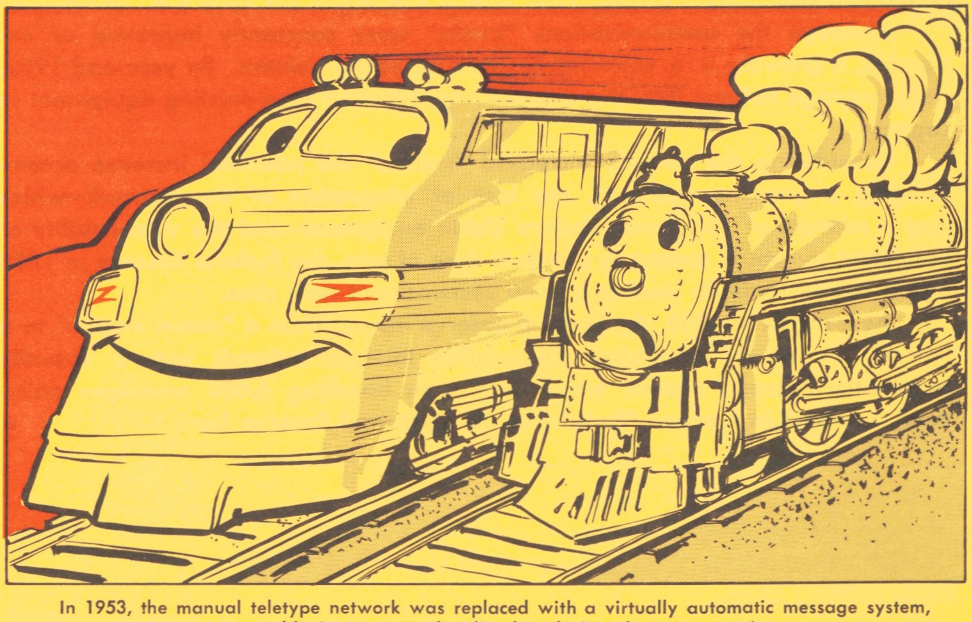
Taking advantage of the latest technology, the first network, a Morse Code system, was in operation by June 1918.

That first network connected only the 12 Reserve Banks, the Board and the Treasury, while today, the highly sophisticated Federal Reserve Communications System connects these same institutions, 25 Reserve branches, numerous regional check processing centers and more than 200 member banks, through nearly 14,000 miles of teletype lines and 25,000 miles of computer circuits.

In the early network, the nation was divided into an eastern division (Cleveland, Philadelphia, New York, Boston, Washington, Richmond and Atlanta) and a western division (St. Louis, Minneapolis, Dallas, San Francisco and Kansas City, Missouri). The Federal Reserve Bank of Chicago, as the Switching Center, was included in both divisions and, through a series of relay points, almost like the pony express, all messages were dotted and dashed through the network to receiving points.

Telegraph operators, called lightning slingers, sitting at Morse Code keys in any eastern division Reserve Bank, sent messages simultaneously to all or selected Reserve Banks in that division directly or through relay points. When the eastern division operator at Chicago received a message for western division banks from an eastern lightning slinger, he either passed it to the western division operator in Chicago or sent it westward himself. The same method could be used to send a message from a western division Reserve Bank at any time during the twelve-hour network day.

However, problems existed. To start, the system was relatively slow, even though the average experienced keyman employed by the Federal Reserve, usually the most proficient in the telegraph business, could tap 200 dots and dashes, about 40 words, a minute. Then, too, virtually from the beginning, use of the system grew rapidly, as evidenced at the New York Reserve Bank, where volume ranged from 75 to 100 messages daily in the first year of operation and averaged more than 600 messages daily ten years later.



In 1953, the manual teletype network was replaced with a virtually automatic message system, comparable in scope to the diesel replacing the steam engine.

Through the early 1930s, the Reserve System began experimenting extensively with teletype systems to replace the Morse Code network which had been expanded through the installation of duplex lines, enabling messages to be received and sent simultaneously between two points in the network.

But, the tests of teletype systems proved fruitless. In fact, the early teletype tests showed such systems to be even slower than the Morse Code system. Although the teletype system also was capable of transmitting 40 words per minute, Reserve Banks found numerous technical difficulties with teletype printouts, which slowed output. Additionally, as suggested by New York Fed Governor George Harrison in 1935, the chance of error would be increased since teletype operators would be less skilled than lightning slingers.

Technology, however, improved substantially by 1937 and the Federal Reserve decided to convert the Morse Code network into one using 60 word-a-minute teletype machines and related equipment. Other "modern" machinery also was introduced, including perforated-tape switching units which eliminated many manual operations in switching messages. Terminal operators were then able to use jack plugs, similar to those on a telephone switchboard, to relay messages to destinations indicated on the incoming perforated tapes rather than resending messages by hand. That is, messages could be transmitted to the appropriate destination using the original tape.

In 1940, the Federal Reserve installed a Western Union semi-automatic, message-switching system on circuits between Washington and New York, and Washington and Chicago. It also established main relay stations at the Board of Governors in Washington and the Chicago Reserve Bank. As a result, Washington was assigned responsibility for moving messages in the eastern U. S. and Chicago in the western U. S. Over several years, more of the network was converted to Western Union equipment, but the overall system remained heterogeneous.

Although the communications "tracks" were constantly improved or expanded, a growing U. S. economy brought increased volume. By year-end 1952, daily average volume over the network was pressing then-existing equipment to capacity.

Considering the already increased "traffic," the potential increase accompanying a growing economy, the lack of integration of the network—which was a mixture of AT&T and Western Union equipment—and the vulnerability of important switching centers to attack in time of war, the Federal Reserve in 1950 again began in-depth studies of new systems and new sites.

As a result, in 1953, the Federal Reserve moved from a "steam engine" to a "diesel locomotive," replacing the existing teletype network with a virtually automatic message system, which was soon handling 6,000 messages daily. And, it moved its junction "Switch" to the Richmond Reserve Bank. ●

## AND WAS AUTOMATED IN THE 50s . . .

By 1953, the international political environment had changed drastically. The Soviet Union had detonated both atomic and hydrogen weapons and presumably had them in production.

Recognizing the basic military fact that one of the necessities in an emergency is a communications system capable of surviving an enemy attack, particularly a nuclear one, the Federal Reserve decided to move the Switching Center away from Washington, a highly vulnerable target. It also decided to consolidate operations and eliminate the Chicago Switching Center.

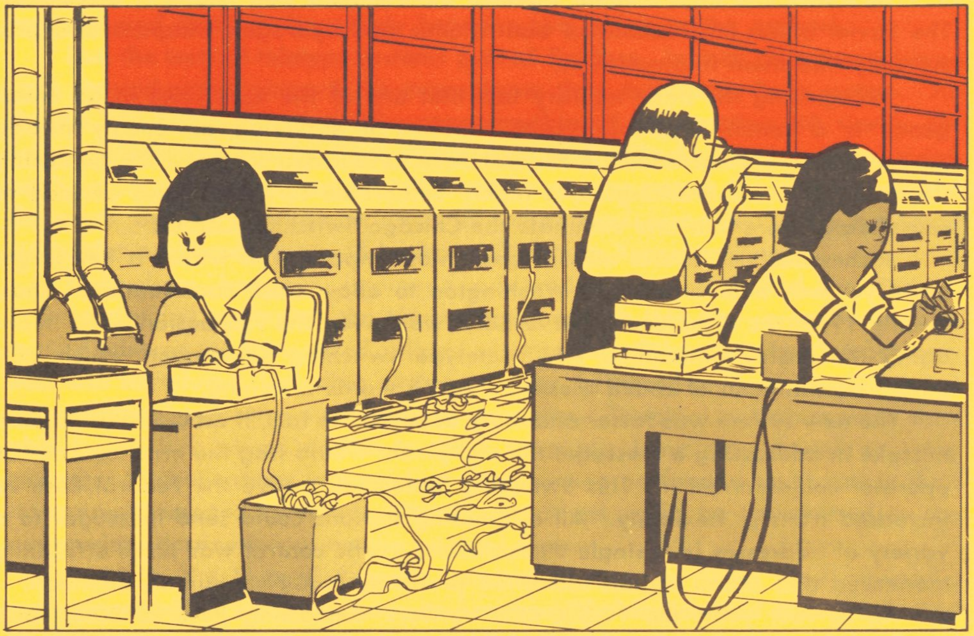
Richmond had several advantages. Most important, it wasn't a key target area, yet was near enough to Washington to allow close coordination. Thus, in July 1953, the Richmond Reserve Bank was given the responsibility for managing the highly automated AT&T teletype switching equipment, which permitted transmission of coded messages at 75 words a minute.

The new system was faster and more accurate. In fact, if an operator made a mistake in addressing a message, the equipment would flag the error so another operator could correct it. This Switching System also gave the Federal Reserve increased transfer flexibility. All originating stations could send messages to a variety of addresses in a single transmission, traffic control was more efficiently monitored and alarm signals identified problems requiring human attention.

In its first year, the 11,000-mile network connecting Reserve Banks and branches, the Board, several Treasury offices, the Reconstruction Finance Corp. and the Commodity Credit Corp. moved hundreds of thousands of messages, valued at more than $788 billion, about three times the size of the national debt at the time.

Within a decade, increased volume required expansion of the network's capability. But even the expanded system soon proved inadequate. ●

## CULPEPER PLANS BEGAN IN THE 60s . . .



During the 1950s, the Richmond Reserve Bank managed the highly automated teletype switching equipment transmitting 75 words a minute.

In the mid-1960s, the Federal Reserve began considering another communications center capable of being expanded to meet projected needs and also safe from more sophisticated weapons.

Clearly, increasing weapons' capabilities of potential enemies of the U. S. widened the number of likely nuclear targets in the country, including areas such as Richmond. In addition, the age of computers had matured and many of the computer's capabilities were found to be of substantial use to the Reserve System.

Although the Richmond Switch had been successful, it was crowded with 110 pieces of equipment occupying parts of two floors at the Richmond Fed. And, while the switch was protected within a solidly built structure, Richmond wouldn't have been an adequate site in the nuclear age, even if remodeled. The decision to move the switch was made in 1967.

Like many other small communities, Culpeper, Virginia, was far enough from important cities to be outside the area of blast effects of a nuclear detonation. In addition, it was accessible to the long-distance lines of the major commercial communications systems serving the nation. Further, a new facility had already been planned at Culpeper to house records of the Federal Reserve Bank of Richmond for use in the event of national emergency. The facility would also contain computers for data processing needs of the Board, equipment to supplement existing computers at the Board and vaults for storage purposes during a national emergency.

With some modifications, the Reserve System concluded, the Culpeper facility could serve as both a records and communications center. On December 10, 1969, J. L. Robertson, then vice chairman of the Reserve Board, dedicated the $6 million, 135,000-square-foot facility. Built into and beneath the stone of Mount Pony, the center rests in the sprawling, historic, northern piedmont of Virginia, where Confederate and Union armies fought a series of major conflicts, including The Wilderness, Cedar Run and Brandy Station battles.

It was ironic Mt. Pony was selected for a communications center, for its history included such use. The top of the mountain was used by the Confederate Army as a signal station and, during World War II, it served as an observation post for spotting aircraft. Later, a U. S. government-operated radar tower was installed atop the 500-foot-high mountain to assist aviators.

The site was possibly named by the Mannahoac Indians, native to the region, as they had been aware of a rock formation resembling a pony's head and a nearby rock drawing of a pony's head. Before it was purchased by the Federal Reserve, the land had been occupied by the Inskeep family since 1774, when King George III of England granted the land to James Inskeep. ●

## AND OPERATIONS STARTED IN 1970 . . .

On August 20, 1970, after three years of development at Culpeper, the first official message was received at the Communications and Records Center. But who the message was from and where it went isn't known, since the message record was eventually discarded.

Like the railroad junction, controlled by a switching tower, the Culpeper Switch operates as the central "junction" for all incoming and outgoing funds and securities transfer messages to and from the Reserve Banks and their branches. In addition, the Switch helps speed economic data exchange among the Reserve Banks, the Board and several government agencies. Each message, containing a coded address, is automatically routed onto the appropriate track and, like an express train, reaches its destination quickly.

Culpeper processes all messages received in a normal 14-hour day, five days a week, with four communications computers and a series of other data and peripheral systems. The Center is connected to each Reserve office by leased communications circuits, much like an office intercom system.

The basic system at Culpeper is comprised of four communications computers, each flashing along at 1,000 characters per second, working simultaneously and enabling the network to continue operating even if some components fail. Special storage units enable the computers to receive information from a Reserve Bank, store the information until it is sought by another computer and route the information at electronic speeds—about the speed of light, 186,282 miles per second—to the next point.

Exterior of the Culpeper facility.

But, these machines aren't totally independent. Monitors enable an operator at Culpeper to watch the computers as they automatically route messages. Any circuit or computer malfunction immediately causes flashing red lights on a six-foot-wide monitor panel, alerting the operator to the location of the problem.

Modern teletype printers, producing 150 words a minute, supplement the monitor-console light system.

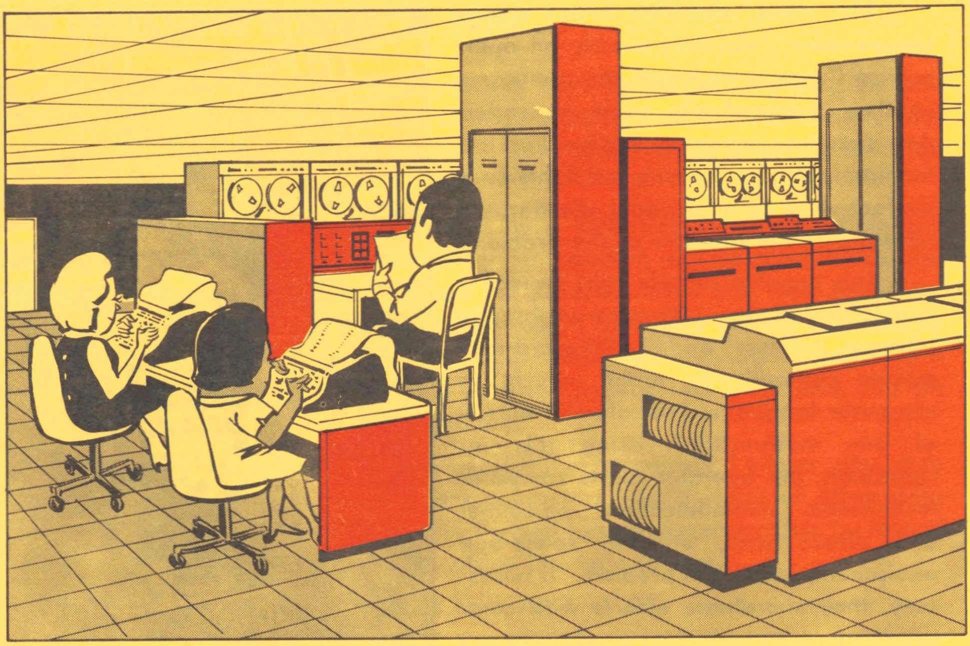
This monitor-console light system is supplemented by 150-word-per-minute teletype printers and 1,200-word-per-minute cathode ray tubes, which, in computer language, indicate the nature of any malfunction. Using this information, the operator alerts computer technicians, communications personnel and others who, utilizing space-age equipment, attack the problem. If necessary, they coordinate efforts with communications personnel at sending or receiving Reserve Banks.

The teletype printers provide a wide variety of supervisory information, too. Regularly, the teletype informs the operator of the number of messages moving into each computer, identifies circuits which are busy or not working properly and the number, if any, of messages waiting on outgoing "tracks" to be routed through the system. The teletype also enables the operator to manually instruct the computers to send messages on alternate "tracks" because of delays or malfunctions.

Indeed, safety and backup for messages and equipment are hallmarks at the Center. The Center is protected by a private Reserve security force which utilizes a variety of systems, from electric eyes to television monitors and electronically controlled doors to insure the safety of the facility. It is also protected by concrete "pillboxes" and other security features.

The Center is equipped with a variety of electric power sources all linked to the basic computer system to provide an uninterrupted power supply. Thus, if one power source fails, a backup system begins operating. Even if the flow of purchased power from the local utility is reduced momentarily, or fails, a battery-operated system immediately provides the necessary current temporarily. Simultaneously, diesel generators start and within minutes take over from the batteries—again without any interruption of the power flow.

Even secondary air conditioning and other environmental control systems are available to keep room temperature and humidity levels constant—essential for computers—should the primary system fail. Indeed, the building's heating and cooling system is unusual, for no standard heating system was installed. The facility is protected from significant temperature changes by insulation and sur-



Four communications computers, flashing 1,000 characters per second, comprise the basic system at Culpeper.

rounding earth. Additionally, the heat from the computers, data units and lights is recycled to warm the complex.

No detail is too small for careful planning. For example:

* Every magnetic computer tape arriving from a manufacturer is run through a special machine to insure it contains no flaws or surreptitious data.
* Clocks are synchronized with the precise atomic-powered clock operated by the National Bureau of Standards in Boulder, Colorado.
* Highly sensitive fire and smoke detectors are located not only in the prime computer area, but throughout the building.
* Specially linked telephones and other devices transmit data between Reserve Banks and the Switch even if normal computer channels are interrupted.

Following a message transferring funds from a customer of a commercial bank in Massachusetts to a customer of a commercial bank in California is like watching an express train speed by at 100 miles per hour.

Suppose Rochelle Patricks, a retail executive of the Boston-based RPN Corp., needs $120,000 immediately to complete a business transaction with TAD Industries in Libertyville, California. From her hotel room in Libertyville—where it is mid-morning--Ms. Patricks contacts her Massachusetts bank, First National Bank of Fullentown, and asks for the transfer of that amount from RPN's Fullentown account to the TAD account at the Libertyville National Bank and Trust Co.

After verifying Ms. Patricks' identity and that she is authorized to withdraw funds from the corporate account, Myriam Samuels, an authorized employee at the Fullentown bank, asks Ms. Patricks to provide the essential information, such as the exact name of the receiving bank involved and that bank's customer to whom the money should be credited. Myriam also logs the time the instructions were received.

Within a few minutes, Myriam passes the form to George Neal, who double checks to make sure the verification code and other information is accurate. He secures authorization from those in charge of the RPN account.

Finally, the form is passed to Jennifer Peters who types the message in the appropriate format into a computer terminal connected to the Federal Reserve Bank of Boston. The message, aimed for the Libertyville Bank in California, shows on the terminal's printer in the Fullentown bank. If the message has been typed accurately, Jennifer simply presses a button at the terminal keyboard, releasing the message to the Boston Fed's computer.

In the Boston Reserve Bank, the computer hums along, checking scores of commercial bank terminals every few seconds to determine which terminal has a message to be sent. Picking up the $120,000 transfer from the terminal at First National Bank of Fullentown, the computer absorbs the message in eight seconds. In two seconds, it verifies the authenticity and accuracy of the message, and insures funds are available in the Reserve account of the Fullentown bank before posting the charge and crediting the account of the Reserve Bank to which the message is being sent—in this case, the Federal Reserve Bank of San Francisco. In the interim, the Fullentown bank has debited RPN's account.


A Boston retail executive instructs the bank handling her company's account to transfer funds to a California manufacturer.


Within minutes, the manufacturer acknowledges receipt of the funds at his company's bank and confirms the shipment date.

During the same two seconds, the Boston computer assigns a reference number to the transfer so it may be recalled later in the day if any problems develop, acknowledges receipt of the message with the originating terminal and routes the transfer onto a track for Culpeper. During the next second, the message flashes along the track to the Culpeper Switch, where it is received in a holding area—a component of the computer which stores messages in a protected memory system.

Simultaneously, multiple copies of the message are recorded on a magnetic disc, a device about the size and shape of a long-playing phonograph record. These discs, made of plastic, rubber or steel, and impregnated with ferrous oxide, are capable of holding 12 million characters of data. In seconds, the information is also automatically recorded on a magnetic tape, which will be stored for 30 days.

When the message is fully received and validated, the computer automatically flashes an electronic signal to the Boston Fed computer acknowledging receipt of the message.

As soon as the message-switching facility at the Culpeper computer is available, the message is processed and routed onto the track for the Federal Reserve Bank of San Francisco. As in the Boston-to-Culpeper transmission, the San Francisco computer sends an electronic acknowledgement of receipt to Culpeper. In seconds, a copy of the message to San Francisco also is automatically recorded on a magnetic tape which will be stored for 30 days.

The San Francisco Fed computer also informs the Culpeper computer of any problems encountered during the message transmission. Depending upon the problem, this information may be stored in Culpeper.

At San Francisco, the receiving computer reverses the procedure used at Boston, feeding the transaction to a terminal located at Libertyville Trust.

Reading the incoming message, Deborah Willey at Libertyville Trust calls the comptroller at TAD Industries—the California firm with which Ms. Patricks has been dealing—and tells him the funds have been received, credited to the TAD account and are available for immediate use.

Within a few minutes, Eric Jeffreys, TAD's chief salesman, calls Ms. Patricks. "Well, Ms. Patricks, our comptroller tells me your payment has been received. You can count on the dress shipment to Boston by next Friday." Assured the contract will be met, Ms. Patrick heads for the airport and home to Fullentown.

Although the transfer between the Fullentown bank and the Libertyville bank was made in a matter of seconds, the overall transfer would have taken considerably longer if both commercial banks involved did not have teletype terminals with circuits to the Reserve Banks. In that case, additional manual tasks and authentication procedures would have been necessary.

Simultaneous with transfers of funds, of course, many messages usually containing diverse items move through Culpeper to and from computer terminals across the nation. Indeed, the Culpeper Switch is designed to process in excess of 25,000 messages each hour. Currently, about 68 percent of those messages involve the transfer of funds. About 8 percent of the messages involve the transfer of securities. The remaining 24 percent contain Federal Reserve System administrative information. ●

## PLANS ARE BEING STUDIED . . .

Together with the development of the Culpeper Switch, the Reserve Banks have moved rapidly to modernize intradistrict communications. In the New York district, for example, a new, message-switching system was placed in operation in 1971. This data system, comprised of two computers, moves more than 22,000 messages, valued in excess of $50 billion, each business day. Nearly 25 percent of those messages are forwarded to Culpeper. The remainder, consisting of transfers between commercial banks within the Second Federal Reserve District, are handled by the New York Reserve Bank. Prior to installation of that message-switching system, an intradistrict transfer took more than 30 minutes. By mid-year 1975, such transfers took only seconds for those banks linked directly to the computer and only minutes for those not directly connected.

Like similar systems at the other 11 Reserve Banks, the New York Fed's network offers substantial and growing benefits. Currently, for example, the intradistrict computer networks are playing a role in reducing the chance of loss or theft of U. S. government securities, because the intradistrict networks allow use of book-entry procedures. These procedures replace certain marketable government securities certificates held by member commercial banks with computer entries on the records of Reserve Banks.

When a bank wants to transfer a specific government security to another bank in the Reserve District, computers "move" the security by adjusting computer records. No security is physically exposed to the environment. A similar


**Analysts are intensely seeking further efficiencies in anticipation of the estimated traffic increase at Culpeper to 250,000 messages daily by 1978.**

procedure is used to transfer a security between Reserve Districts through the Culpeper Switch.

At mid-year 1975, about $244 billion, or 77 percent of $315.6 billion of marketable U. S. government securities, were in book-entry form at Reserve Banks. Almost $176 billion of the securities in that form were on the records of the New York Reserve Bank and about $14 billion were transferred each business day by the New York district.

As intradistrict networks are expanded and new equipment and uses are developed, the overall Reserve System communications network will become more efficient and more useful. Clearly, too, the Culpeper Switch, developed through the Reserve System's experience and know-how in electronic communications, will play a fundamental role in reducing the billions of checks issued and processed annually. It is hard to tell what the future "payments mechanism" will look like, but the Reserve System is already developing approaches to meet the financial needs of the nation.

For example, it is expected that transfers of funds through Culpeper will increase to 250,000 transactions a day by 1978, because of the greater use of automated payroll deposits and the exchange of payment information between Automated Clearing Houses (ACH). Transmission of economic data, additionally will increase 10 percent a year. In preparation, throughout the Reserve System, analytical staffs are already intensely studying a variety of alternatives.

Among the possibilities is a plan to exchange large numbers of payments as a group rather than as independent messages—much like a railroad boxcar carrying a load of similar items destined for the same place. This would involve military payrolls, Social Security payments and interregional ACH items.

Plans for expansion of the Federal Reserve Communications System are under continuous examination. These plans include increased equipment and circuits using new concepts and facilities. Efforts to institute automated funds transfers also are being made internationally, as the world's economy becomes more interdependent.

As technology advances, the Reserve System will continue to explore new opportunities to meet the initial directive of the Congress to improve the flow of funds throughout the nation. ●

# FEDERAL RESERVE COMMUNICATIONS SYSTEM