

AMATEUR RTTY

RADIOTELETYPE · RADIO PHOTO · RADIO CONTROL



A PAGE-STYLE TELETYPEWRITER

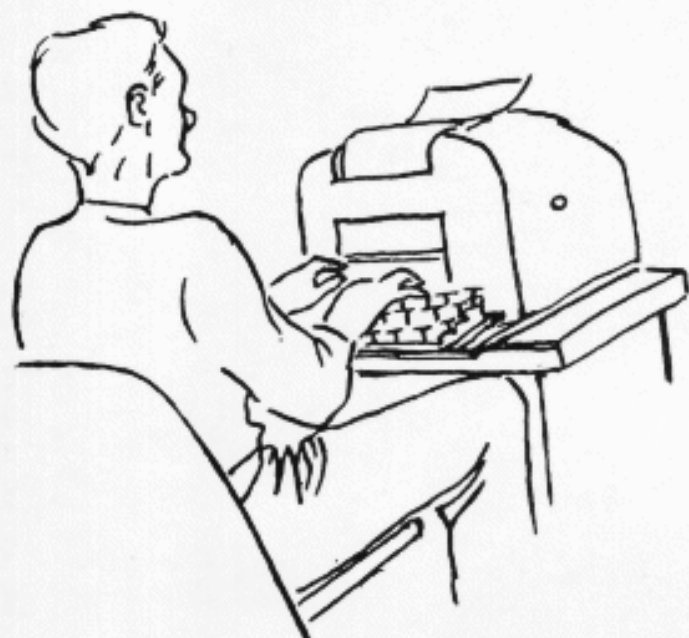
- - RADIOTELETYPE - -

The Fastest Growing Branch Of The Amateur Radio Hobby.

What Is It All About? How Did It Get Started?

Start and Growth of RTTY

Amateur Radioteletype, founded in 1946 by W2BFD, had 30 printer-equipped members in the New York City area before the year was out. Numerous lectures and demonstrations were presented at radio club meetings during the following two years, including participation in an ARRL convention and a broadcast via BC stations and "Voice of America" programs. Articles dramatizing this new development in amateur radio appeared in "ham" magazines in 1948, arousing great interest and resulting in the rapid expansion and spread of teletypewriter activity to all parts of the country. By 1949 pioneer RTTY stations began operations in places as widely scattered as Oregon, Washington, Illinois, Missouri, New Mexico, California, Louisiana, Indiana and Ohio. Today there are several thousand members of the national radioteletype organization. Amateurs who had been letting their licenses lapse, for lack of novelty in "ham" communications, write to say, "At last there is something new in amateur radio!" What is Amateur RTTY? Here is the "lowdown."



The Big Secret

During World War II commercial and military RTTY came into being. For a number of years it was strictly "hush-hush" stuff, but it was inevitable that word of this tremendous forward step in radio communication would leak out. For the first time it permitted errorless transmission and reception of intelligence, with the positiveness of the printed page, at speeds ranging from zero to 100 WPM. Any person able to press a typewriter key becomes capable of sending up to 65 WPM with a few weeks practice. More important, no receiving operator is required! Telegraph printers are simple mechanical devices, no more complicated than an electric typewriter.

The technical "trick," making RTTY so indifferent to the various problems besetting CW, such as fading, noise, QRM and weak signals, was the adoption of Frequency-Shift Keying (FSK). This is nothing more than the "wobbling" of the frequency of a CW transmitter a few cycles, instead of keying it on and off. Sounds simple, doesn't it? But in the method of receiving this "wobbled" signal is the entire secret of the effectiveness of FSK. With FSK, noise cancels out and fading is nullified over at least a 60 DB range, by methods not applicable to regular CW systems. FSK holds the same advantages for printing telegraphy that frequency-modulation offers sound broadcasting; i.e., freedom from noise, amplitude changes and distortion of the signal.



A TAPE PRINTER
PRINTS ON NARROW RIBBON OF PAPER

But Why Printer?

As you will notice from tuning the commercial and military portions of the radio spectrum, most traffic is being handled by machine today. Large transoceanic communications companies, such as Mackay Radio and Press Wireless, report that all but a few unimportant overseas morse-code circuits have been converted to frequency-shift radio printer. These services have discovered that even machine-sent morse cannot handle message traffic with the ease and accuracy of radio printer. It is a safe bet that, within a very few years, practically the only CW heard will be within the amateur bands. The commercials are rapidly dropping it in favor of FSK and a few other static-and-fading-free techniques. They have spent millions of dollars in the conversion of

their CW equipment because of the demonstrated ability of FSK to get through when the going got "tough."

Two difficulties barred radio amateurs, until 1946, from taking their usual pioneering place, in RTTY development, that they have held in other fields of radio communication. First; Printing telegraph equipment costs up in the thousands of dollars at new prices, and very little less second-hand. A traditional policy with all wire and press telegraph agencies has been the complete destruction of all good usable superseded teletypewriters. Second; Frequency-Shift Keying, while extremely simple to produce at the transmitting station, required very complex and expensive narrow-band wave filters at the receiving station to detect and demodulate the FSK signal to "key" the receiving teletypewriter.

Amateur Teletype Is Inexpensive!

The first difficulty, that of price, was overcome in 1946, after more than a year spent harassing the various telegraph companies and wire services. Working contracts were established with one and then another of these outfits, until today all of the major users of printing telegraph equipment are furnishing inexpensive machines to amateurs, on a non-profit basis, through the national organization, at prices representing just about the cost of bookkeeping and handling. These machines are replaced with more modern units and are removed, working, from telegraph wire lines. Teletypewriters are also secured from many of the smaller communications companies through agreements with the Society. Equipment ranges in cost from about the price of an 807 tube to what you might expect to pay for a good VFO!

A Low-Cost FSK Unit

The second major obstacle was bypassed, through the development by W2BFD during the war, of a simple substitute for the sharp audio wave filters hitherto required. Two small audio amplifiers, each with two stages coupled by tuned circuits just as in an I.F. amplifier, give all the selectivity required. A four or five-tube teletype "converter" unit will give magnificent black-and-white printed copy, at 65 WPM, from stations all over the world, from both amateur stations and commercial transmission of news and third-party traffic. When assembled according to simple instructions, blueprints and photographs, available from the RTTY organization in New York, really startling performance can be had under conditions that would gray the hair of a cw operator. It is quite fascinating to watch one of these typing-units, knocking out traffic at the rate of 300 messages per hour, keyed by a scarcely-audible signal almost completely buried under an S-9 noise level.



Perforated-Tape Sending

RTTY holds a particular appeal to the CW traffic "hound" because it permits, if desired, the perforation of a paper tape with all the traffic in advance. This tape can be "edited" for typing errors and, at "sked" time, can be transmitted at a constant 65 WPM without hesitation and requiring no repetition or "fills." At the receiving station the operator can be busy elsewhere in the "shack," perhaps building a new piece of gear or even working another station! Unlike morse tape, teletype characters are punched crosswise on the tape, making for extreme economy of paper because it stores 10 characters per inch of tape. Many amateurs employ their printers as typewriters since machines cost less than the cost of a good rebuilt typewriter. Some RTTY members, who relay traffic between CW and RTTY nets, type directly on their printers while receiving CW and, thus, eliminate later retyping. A reperforating device can be switched on, which will store incoming signals, in the form of a perforated tape, at the same time an inked copy is received on standard 8 1/2" wide roll-paper. Reperforated material can be retransmitted later without having to type a word of it.

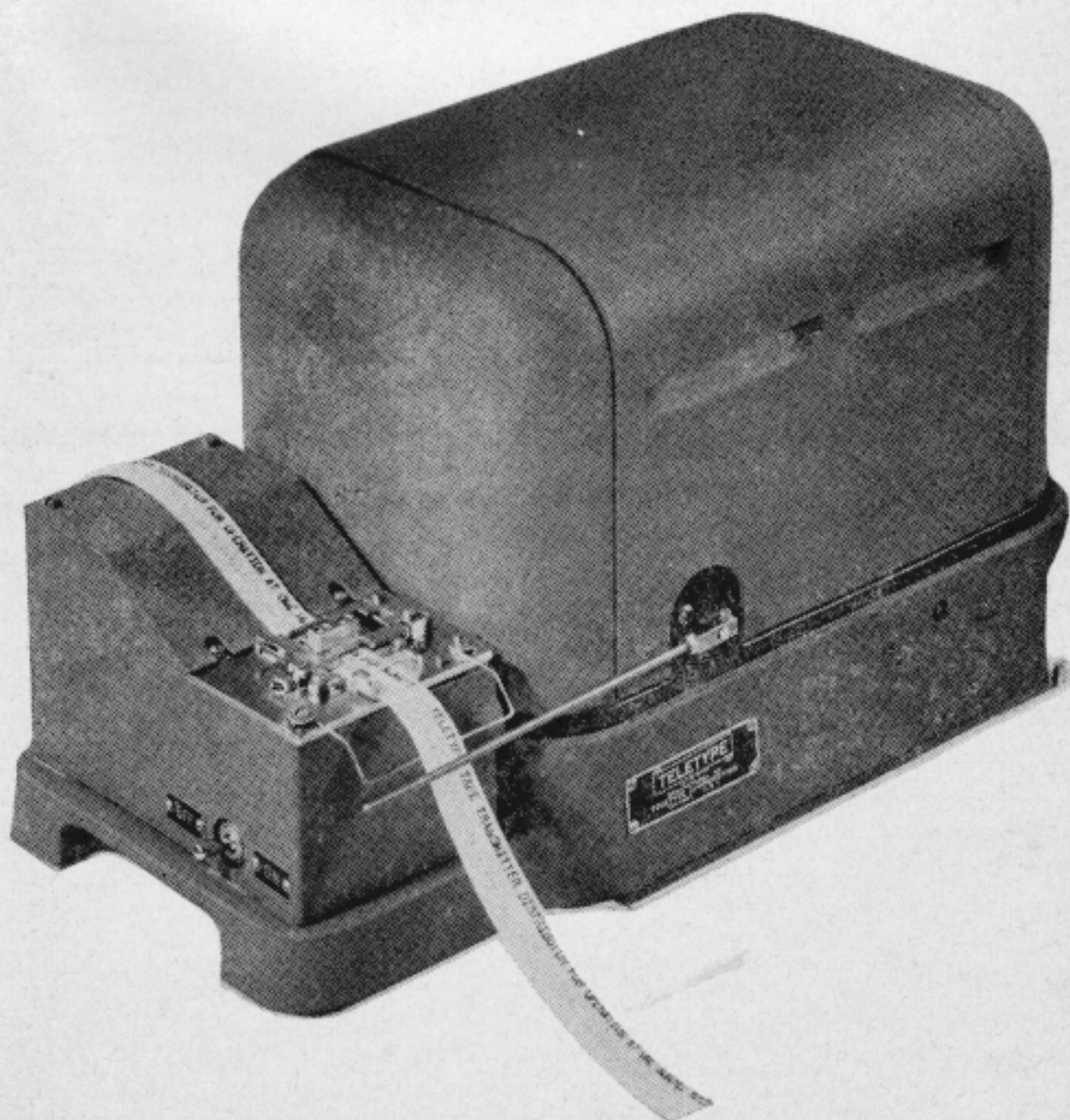
RTTY With Continental Code

RTTY with Continental Code

A recent innovation is the development of circuits which permit the use of the teleprinter equipment for International Morse Code. Speeds from zero to over 100 WPM are possible. With this method the machine may be manually or automatically switched back and forth from one code to the other.

Unattended Auto-Start Reception

All of the present enjoyments of hamming can also be had with RTTY. But there is an added "something." Since 1947 the RTTY "auto-start" net has blossomed from a mere handful of stations to hundreds of installations around the country. An RTTY station employing "auto-start" can receive messages and traffic without the operator being present, and without leaving teleprinters running or tubes lit continuously night and day! You can "hit the sack" early and yet wake up in the morning and read a "solid" copy of any messages left for you the previous evening, or perhaps, when you were away earning the family bread-and-butter! If you have not had previous contact with



TAPE-SENSING "HEAD"

FOR HIGH-SPEED AUTOMATIC SENDING



amateur teletype this statement will probably sound fantastic to you but it is taking place, hundreds of times, every day! Standard auto-start calling frequencies, for unattended operation of distant printers, have been in use for many years on a national scale, with additional calling channels serving regional groups in many localities.

Radioteletype on All CW Bands

Until quite recently amateur printer operation, using FSK and AFSK, was restricted to ham-bands higher in frequency than 27 Mc. Some foreign DX work took place on the 10 and 11 meter bands several years ago and a considerable amount of "G.I." traffic was passed stateside from Japan via amateur teletype, using FSK, at that time. The miserable propagation conditions later prevailing on these frequencies called a halt to transoceanic and transcontinental ham RTTY operations. Through the vigorous campaigning of W2NSD, at that time the publisher of the A.R.T.S. National Bulletin and the RTTY columnist of **CQ** Magazine, RTTY members all over the country were urged to petition FCC for increased spectrum space. The momentous decision, set forth in Docket 10073 by the FCC, in legally opening the non-phone portions of all amateur bands on February 20th, 1953, to mechanized telegraphy, changed the DX picture entirely. Even under poor radio conditions, radioprinter contacts are quite frequent between the east and west coasts, because of the unique ability of FSK converters to distinguish between noise and weak signals.

VHF Operation of Printers

As a result of the earlier frequency restrictions, it was natural that VHF operation of amateur printer networks would be farther advanced than on the low-frequency portions of the spectrum. VHF operation still predominates and is very extensive in the United States. The ability of the frequency-shift equipment to "balance-out" the noise has made possible VHF radio-relay links, better known as "repeaters." In these relay systems a string of stations, covering a span of many hundreds of miles, can be set up with each station spaced 35 to 100 miles from the next. Power on the order of 5 to 20 watts is usual. Each station receives the signal from the preceding **repeater**, "cleaning out" the noise, etc., and operates a polarized relay with it. This relay controls, not only the local receiving teletypewriter, but also keys a "brand-new" locally-generated outgoing signal. The next station along the circuit does likewise. On the VHF, to ease the frequency stability problem, the carrier wave is not "wobbled." Instead, an audio "sub-carrier," which is fed to the microphone input of a regular "fone" transmitter, is frequency-shift keyed. This is known to the teletype "gang" as "AFSK." AFSK has most of the beneficial noise-and-fading reduction properties of regular FSK and is standard practice on all VHF bands.

Simplicity of Installing Teletype

On all VHF bands, and also 11 meters, where AFSK is employed, **absolutely no changes** are required in your regular radio transmitter and receiver! The teletype converter plugs into the transmitter microphone jack and the receiver headphone jack. **That's all there is to it!** On the FSK bands a one-tube, or even a germanium-crystal, frequency-shifter is added to your VFO or crystal oscillator to produce the few cycles of "wobble" required. The receiver, just as in the VHF case, is merely audio-patched to the converter panel. **The same converter is used for both FSK and AFSK operation.**

Facsimile and Remote Control

Successful operation of a teleprinter is essentially a remote-control problem wherein one must be able to continuously perform over 60 different operations selectively at the distant printer in rapid succession. These "selections", as they are called, consist of the various characters of the alphabet, numbers and punctuation, in addition to the "stunts". The stunts are the functions controlled by the shift, unshift, carriage-return, paper-feed, space-bar, and signal-bell keylevers.

Because of the close association between teletype and remote control, experimentally-minded amateurs interested in the radio-control of distant equipment requested that the scope of our organization embrace R/C also. The organizations furnishing teleprinter equipment, in many instances,

are users of wire-photo apparatus in addition. A small quantity of this "Fax" equipment has been released through the Society. Arrangements have been made to secure this equipment, for RTTY members, under the same procurement plan as the printers. Due to vast variation in facsimile machine models, standards have not been completely established for amateur operation. Methods have been developed whereby auto-starting of a distant radio-photo machine may be accomplished to send, for example, a photograph or diagram, and then switch on the teletype printer to send a written description. The receiving "Fax" machine can also be operated unattended.

Amateurs interested in Teletype, Facsimile, Remote Control and Amateur Television are invited to make use of the facilities of our Society and bulletin.

THE "OLD MAESTRO," ORIGINATOR OF AMATEUR RADIOTELETYPE
AND SECRETARY OF THE SOCIETY, JOHN WILLIAMS, W2BFD



Organization in the True Amateur Spirit

The national society was formed by the pioneer radiotypers almost simultaneously with the startling demonstration of the first amateur printer operation. It was immediately realized that, to be successful, ham RTTY had to have rigid standards of operation. The standards adopted have now become part of FCC regulations governing amateur printer operation. Another factor was the procurement of equipment, since the commercial wire companies would not deal with individuals or small clubs. Unlike any other phase of amateur radio, teletype machines can not be bought at the local radio stores or ham "emporiums." As a matter of fact, the Society has furnished all but a very few of the several thousand machines now in amateur hands. These few exceptions were either (1) Found in military surplus (this source has been exhausted years ago) (2) "Borrowed" by ham employees of communications companies, or (3) Obtained from some of the smaller users of teletype machines, releasing too few to justify a regular contract.

Publication of the Bulletins

Until 1952 the Society published hundreds of one and two-page bulletins dealing with the technical aspects of amateur RTTY equipment and also the "activities" of our members. The circulation of these bulletins was handled by W2BFD, the founder of amateur RTTY, who was, and still is, National Secretary of the expanded organization. Before 1952 the procurement of printing telegraph equipment, on a non-profit basis, had grown to such an extensive operation, involving the obtaining of thousands of teletypewriter items, that serious consideration was given the curtailing of our bulletins and newsletters. Around that time W2NSD vol-

unteered to assume the responsibility and financial burden for the publication of the National RTTY Bulletin, thus tremendously easing the load on the headquarters organization. For 3 years W2NSD did an outstanding job of publicizing the activities of the RTTY "gang" until it simply became too much for one man. Early in 1955 the task of publishing the ARTS Bulletin was taken over by a 5-man group, headed by Editor Clayton Cool, freeing the Society to pursue its main objectives, which are the furnishing of equipment and technical information, and to act as the representative of its members in matters pertaining to RTTY. Amateurs desiring to obtain machines and accessories on a non-commercial basis are invited to communicate with the Radioteletype Society, 38-06 61st Street, Woodside 77, N. Y.

RTTY Clubs

In a large number of cities local radioteletype clubs and regional RTTY Societies have been formed, to take care of amateur problems not requiring national cognizance. These have done considerable good to the "cause", particularly in furthering relations with public agencies such as Red Cross, Civil Defense, Mars, C.A.P., and local police and fire departments. For a number of years amateur radioteletype members have participated in communications drills with these agencies and also in other ways, such as reporting by radioteletype for motorcycle races, staging college "alumni-day" traffic-handling circuits, handling thousands of free Christmas messages to military personnel overseas, etc., etc. A typical "stunt" run yearly by members of the NY/RTS, the local New York City group, has been the Radiotype reporting of election results from upper New York State polling places to the municipal broadcasting station of New York City. Some bona-fide emergency traffic hand-

ling has also been performed. These RTTY clubs, regional groups and state-wide societies may secure teletypewriter equipment through the national organization on a "bulk" basis, for piecemeal distribution to their own members, provided they meet certain conditions. These local groups are required to guarantee the securing of the "Waiver of Commercial Intent" and limited as to the amount at which the machines may be resold.

National RTTY Headquarters

When first established the Society set up its headquarters in borrowed space in the rear of W2BFD's place of business. With the great increase in membership, which has since taken place, more space became necessary. The problem took care of itself very nicely, when the Electronic Device Company moved elsewhere, and the entire premises in Woodside were taken over for the handling of RTTY affairs. The Society maintains precision frequency standards and recording equipment at its offices, with which most of the pioneer printer stations "lined up" their filters and shift equipment. A service provided by Headquarters is the mailing of tape, wire and disc recordings of the standard AFSK frequencies and recorded teletype test messages. From HQ are transmitted, by radioteletype and by mail, bulletin-letters on technical subjects, announcements of releases of quantities of teleprinter equipment by various communications services and news of special activities.



The "Waiver"

The main objection that commercial companies raised to the request that they change their age-old policy of demolishing perfectly usable, often near-new, equipment which is replaced with later-model machines, was that it might find its way into commercial, possibly competitive, hands. The solution to the problem was reached when the Society agreed to have its members furnish a "Waiver of Commercial Intent," to be kept on file at RTTY Society headquarters, photostats of which are available to the particular wire company releasing the equipment. This "waiver" binds the purchasing amateur to obtain and send to the Society a new "waiver" from the prospective new owner before relinquishing the machine.

AMATEUR RADIOTELETYPE SOCIETY VHF TELETYPE SOCIETY

THE NATIONAL ORGANIZATION OF RADIOPRINTER AMATEURS
38-06 61st Street + Woodside 77, N. Y.

"WAIVER OF COMMERCIAL INTENT"

Date: _____

The teleprinter(s), or accessories, which I am purchasing through the agency of the Radioteletype Society or, indirectly, through _____ (name of individual, local, regional or state-wide radioteletype society when used) is (are) to be utilized as amateur radio station _____ (to, if not listed, or none)

In obtaining this apparatus I agree to the following conditions:

- (1) It will not be used for the garfurl interception of commercial message traffic or retransmission.
- (2) It will not be used for the demonstration of commercial electronic equipment.
- (3) It will only be employed for amateur radio communications or amateur experimental work.
- (4) It will not be used in any applications contrary to the regulations of the Federal Communications Commission.
- (5) It will not be used to other than an amateur station and then only under these same conditions.
- (6) I agree, before reselling, to obtain and forward to the Society's headquarters, a similar "Waiver" from the prospective purchaser and will not surrender the equipment until this has been done.
- (7) As an earnest of good-faith in the above conditions, permission is granted for inspection, upon written request, by an employee of the particular company furnishing the equipment or by an amateur appointed by the Society, to substantiate the use to which the machine is being applied.

Signed: _____

License of Amateur Station: _____

Address: _____

Notary Public: _____

File No. _____
Machine Serial No. _____

Membership in Society

There are no dues or other obligations for membership in the national society. Possession of a teleprinter, facsimile machine, etc., and a signed copy of the above-mentioned "Waiver" automatically confers membership. All officers of Amateur Radioteletype Society serve voluntarily and without compensation. The Society is self-supporting, maintained through the sale of technical literature. Contributions to the "postage fund" have helped considerably.

Constructional Data Available

A large number of design variations have been developed by individual members since it was first established that radio amateurs **could** get RTTY printers to work with simple and inexpensive electronic converters. It is interesting to note, however, that blueprints and data for construction of the first publicized amateur standard RTTY converter is still in heavy demand and, because it antedates all others, this converter or its numerous variations is used in approximately 1/3 of all amateur installations. A group of 9 blueprints and considerable reading matter is available in a "package" requested as ARTT-6002 from society headquarters.

A later model of the standard converter, identified as ARTT-6034, was designed for greater operator convenience and additional features, while retaining the time-tested fundamental circuitry. Among the features of the newer converter unit are (1) An improved auto-start circuit. (2) Facilities for relaying radioteletype messages into and out of Red Cross, Civil Defense, Western Union and military wire-telegraph lines in an emergency, without necessity for retyping. (3) Provision for connecting tape perforating and transmitting equipment. (4) Facilities for relaying one RTTY station's signals to another automatically. (5) Built-in self metering circuits. (6) Circuits for remote-control of other associated equipment besides the printer, such as radio transmitters, reperforators, etc. The ARTT-6034 package of data contains 7 blueprints, one of them a full-size drilling template eliminating all of the layout work. Several 8x10 photos and a large amount of printed data are also included.

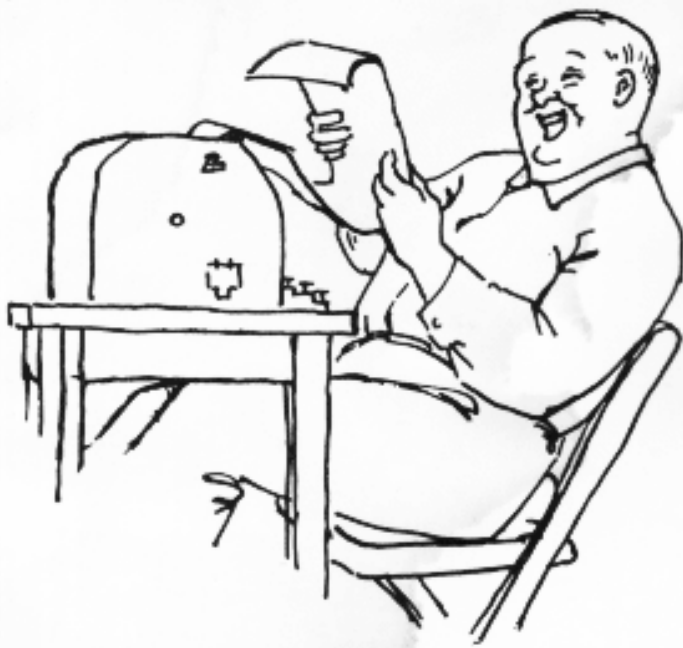
Another data package, ARTT-6045, provides the instructions, views and schematics for making the "RTTY-CW" conversion, mentioned earlier.

Sequential Selection

Data package ARTT-6056 deals with the simple printer modification required to adapt the machine for operation as a "Sequential Selector". By means of sequential selection a very large number of remote control "stunts," in the ham shack, may be performed by teletype, such as the remote control of radio transmitters, receivers, etc. In fact almost any conceivable device, normally operated with switches, may be controlled from a distance of hundreds, or even thousands, of miles by means of a teletypewriter sequential selector. The simplest system provides 32 control functions, each performed by the depression of a single typewriter key in less than 1/6 of a second! If more controls are required, a system using combinations of two keys yields over 1000 functions, in about 1/3 second. Three-key expansion of the idea would



TAPE REPERFORATOR



permit remote switching of well over 30,000 circuits in around 1/2 second! The total cost for the addition of "sequential selection" is only about \$1 over the cost of the teletype machine itself! Among the many other controls possible with this development are the remote selective starting of a tape perforator, when traffic which requires relaying to a third station is transmitted. The remote starting of a Facsimile or Radiophoto machine to transmit, say, a drawing or photo to accompany the teletype-printed text or, by means of a "Dorfman" circuit, the sequential selector can receive incoming teletype messages and simultaneously retransmit them as CW morse code messages. The "sequential selector" was designed by W2BFD to perform as the controlling device for a "Teletype-to-Braile-Typewriter Translator". The "Translator", is being developed, in cooperation with W2QGH, to make possible the reception, by blind persons, of teletype messages.

A reprint of a large number of pioneer bulletins, dating back as far as 1946 and containing a wealth of information for members who have joined in the past 7 or 8 years, is available as ARTT-6078.

Selective Calling

With the common variety of auto-start reception the teleprinter receives all the transmissions made on the calling channel by stations within radio range. By an amplification of the basic "sequential selector" circuitry a teletypewriter may be made operative **only when the proper sequence of characters is received.** These characters may be your own call letters, or any other combination of letters, figures or punctuation marks. Constructional data for the incorporation of "selective calling" is contained in data package ARTT-6064.

The RTTY Handbook

The first edition of the pioneer RTTY manual has been sold out and a revised new edition of the handbook is "in the works". The handbook had its crude beginning in a 23-page set of pencilled notes, by W2BFD in 1946, which was circulated from hand to hand, to enable each new member to get his machine on the air in a more-or-less standardized fashion. Amateur radiotyping was aided tremendously when W3CZE volunteered to defray the expense of having the notes reproduced in printed form out of his own pocket.

THE RTTY RADIOTELETYPE AMATEUR'S HANDBOOK AND MANUAL



DEVOTED TO
RADIOTELETYPE
RADIO PHOTO
RADIO CONTROL

PUBLISHED BY THE NATIONAL ORGANIZATION OF RTTY AMATEURS
AMATEUR RADIOTELETYPE SOCIETY

AMATEUR RADIOTELETYPE SOCIETY

V. H. F. TELETYPE SOCIETY

38-06 61st Street, Woodside 77, N. Y.

POSTMASTER:

Form 3547 Requested

. . . RADIO NOVICES . . .

RTTY is Simple !

Compared with the complication of radio theory, radioteletype should be "ducksoup" for the Novice and beginning amateur. One is not dealing with intangible electron flow but, rather, with a mechanical device, scarcely more complex than an office typewriter.

Understanding the mechanics of teletype operation can be gained merely by rotating the motor shaft by hand and watching what takes place in the machine. It's as simple as that. Of course, as familiarity is gained with these intriguing printers, specialized circuits may be added to the "basic" setup.

