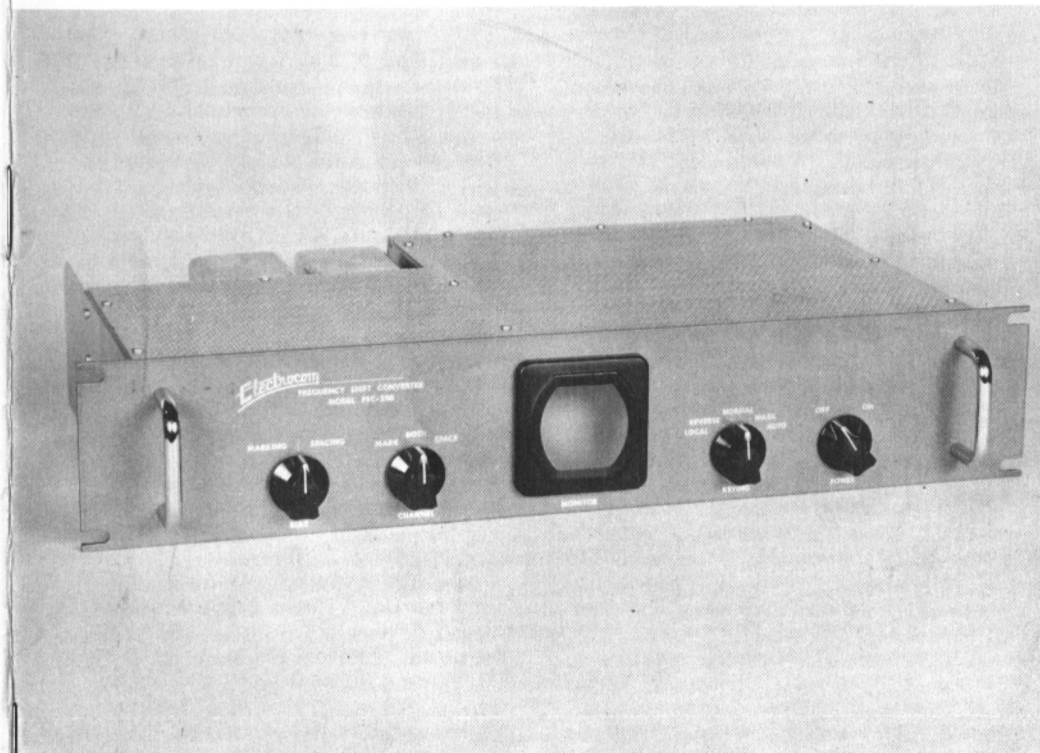
RTTY



THE ELECTROCOM INDUSTRIES MODEL FSC-250 FREQUENCY SHIFT CONVERTER

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NEWS OF AMATEUR RTTY

JULY 1960
25 Cents
Vol. 8, No. 7

HORSE TRADES

This page of the Bulletin is for use of amateurs who have RTTY EQUIPMENT FOR SALE OR TRADE and those looking for equipment to buy or trade. It is a free service and may be the means of getting someone on the air.

WANTED: Collins 51 J Receiver K9POU
FOR SALE: 14 TD, 14 Typing reperf, no end of line indicator. 28 Machine, with Automate, Elec Srvc unit, Auto unshift on space, table model, WE Grey, ligh keyboard, $600.00 complete or will sell separately W9HHP
FOR SALE: Model 26 with table and TU, $75.00 ...... W6NMK
FOR SALE :Iron Horse mechanical perforator ...... KØEWU
FOR SALE: KWS-1, 1,200.00-75-A-4w/spkr, 575.00— Drake fone patch, 18.00—TEL-REX hvy duty rotator, 125.00 .... W3CZE
WANTED: Information on the following: 133A1, Table, XD109GW TD, MXD10, tape head, MXD11 TD W5BOT
RTTY Parts and Services. W2ZKV, W6EV, W9GRW, K7ABB.
FOR SALE: Bound 1959 RTTYs 5.00 .... RTTY, INC.

RTTY, Inc.
372 WEST WARREN WAY
Arcadia, California
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"THE HISTORY AND BACKGROUND OF RTTY, OR AMATEUR RADIOTELETYPE"

Presented by **WM CARTER, JR., W5ANW.** At the 30th Annual West Gulf Division Convention of the ARRL held in Dallas, Texas, June 18th, 1960

It was the harnessing of electricity that almost overnight catapulted communications into the modern epoch. With the sending of the first telegraph message, by the inventor Samuel F. B. Morse in 1844, both time and distance were conquered with a single instrument.

But early telegraphic communication, amazing as it was, had its drawbacks . . . Rigorous training was needed for operators to acquire skill in transmitting and receiving the Morse code and it took two operators to get a telegram over the wires.

What telegraphy needed was a system whereby the messages could be received automatically in the form of typewritten, or "printed," alphabet characters instead of a series of audible dots and dashes.

An early attempt was the invention of Royal E. House of Vermont, patented in 1848. It had a piano style keyboard and used compressed air to actuate the mechanism which employed a typewheel and printed on a tape.

A significent development occurred in the year 1874, when a Frenchman, named Emil Baudot, worked out a system of printing telegraphy using a five-unit selecting code which is still in use and is called the Baudot code.

In 19Ø2 Joy Morton, head of the Morton Salt interests and his friend Charles L. Krum, a distinguished mechanical engineer set up a laboratory to develop the printing telegraph . . . Exepriment succeeded experiment, with many moments of doubt . . . but progress was encouraging, and finally the Morkrum Company . . . named for Morton and Krum, and later to become the Teletype Co. was incorporated on October 5, 19Ø7 with a capital of $150,000.

By 19Ø8, the first working model was made that looked good enough to test on an actual telegraph line. The printing portion was a modified Oliver typewriter mounted on a desk with the necessary relays, contacts, magnets, and the interconnecting wires.

Joy Morton, who was a director of the Chicago and Alton Railroad, arranged for a trial on the railroad's wires between Chicago and Bloomington, a span of about 15Ø miles. The trial was highly promising and Charles, and his brother Howard, went back to work to develop a small neat direct keyboard typewheel printer.

This was a period of basic invention and widespread experimentation with printing telegraph. Western Union was handling a part of its traffic with a system called the Barclay. There were many other systems, two of which, the Hughes and the Baudot were being used extensively abroad.

The most serious problem was maintaining synchronism between the sending machine and the remote printer. If the distant unit was "off" or out of synchronism with the sending unit, it would receive the signals in improper sequence and print gibberish or "junk." For reliable transmission, the transmitting and receiving units had to be "in step" with each other, and the synchronism had to be maintained throughout the transmission.

It remained for this problem to be solved before the printing telegraph could take giant steps in the communications world.

Among Howard Krum's many contributions to printing telegraphy one of the most significant was his solution to the problem of synchronizing the sending and receiving units.

A brief look at how teletype equipment works is helpful in understanding the importance of this accomplishment.

The printing telegraph of today operates on a circuit which is in effect a "series" loop . . . That is to say that all of the machines are in series with each other, as in the key type telegraph circuit. Resistance is added or removed to make the closed circuit current about 6Ø mils. The usual potential is about 1ØØ volts D. C. And since most of the teletype equipment is of low resistance, we can consider it a constant current system in the "closed" or "mark" condition.

A brief explanation of the terms "Mark" and "Space" is in order at this time.

As in the key telegraph, the closed line condition is termed the "Mark" or "Marking" condition and the open line condition is called the "Space" or "Spacing" condition. This nomenclature dates back to the early days of the Morse telegraph system when ink pen type equipment "marked" the dots and dashes on a moving tape hence the closed line operated the relay coil to bring the pen down to the tape, or marking, and the open line released it between the dit and dahs (to space between them on the paper).

Teletype machines operate by the transmission of electrical "pulses" from a sending unit to a receiving unit . . . The sending unit creates the pulses by mechanical action . . . following the pressing of typewriter like keys. The receiving unit converts the pulses back into mechanical action, producing typed letters or figures. The illustration on Page 6 of the "Teletype Story," graphically explains this action.

With the Morse telegraph, the operator who receives listens to a code consisting of a series of unequal dots and dashes . . . and then translates them into the written word . . . Teletype machines "listen" to a code in which each letter or number is made by a combination of electrical pulses of equal length and then automatically translate this code into printing . . . But the receiving machine must be "listening" in unison with the sending machine.

Howard Krum's idea for keeping sending and receiving machines together was to add a "start" pulse before each code combination and a "stop" pulse after each code combination. This provided a fresh start and a correction period for each character and made it comparatively simple to keep the receiving and sending machines in step for the fraction of a second required to transmit a character code combination. Thus full synchronization was achieved.

The printing telegraph was gradually improved until, at the time of World War II, it represented the principal method used by the news services as well as the usual means of telegraphic communication.

During this period many of the methods now in common use for the transmission of the Baudot teletype code via radio were developed. Currently in use are two methods for conversion of the "mark" and "space" D.C. pulses into a signal which can be transmitted by radio.

The first, and least used, is a method called "AFSK" or the audio frequency shift keying method. In this method the "on" or "off" pulses representing the "mark' and "space" condition of the local line are used to key an audio oscillator in such a way as to result in two tones, or audio notes representing the "marking" and "spacing" elements of the teletype code, the two notes usually used in today's practice are 2125 cycles for the "marking" and 2975 cycles for the "spacing" condition.

Other standard AFSK frequencies are multiples of 17Ø cycles between 2125 and 2975 cycles. The frequencies of 2125 and 2975 were chosen since they are the fifth and seventh harmonics of 425 cycles and multiples or beats thereof never fall in such a position as to cause interferring beats which might pass thru the receiving filters and cause misprints.

These two tones are then used to modulate an RF carrier and at the receiving end they are again returned to D.C. signals by what is known as a converter. The convertor is merely a device which contains two resonant circuits. These are tuned to the frequencies of 2125 and 2975 cycles. A relay operated by these two tones is used to recreate the DC "mark" and "space" pulses in a local "loop" . . . which operates the teletype printer in the same manner as the telegraph line.

The second method, which is the one most frequently used by both commercial and amateur stations, is the "FSK" or frequency shift keying system .This method shifts the RF carrier from a "mark" radio frequency to a "space" radio frequency 85Ø cycles lower. Remember that both of these frequencies are RF continuous wave unmodulated carriers. The shift is such that as one carrier goes "off" the other goes "on" and the spectrum between the two is not used as it is in the transmission of facsimile. This FSK system uses a definite RF carrier position for mark and another for space.

In this system the signals from several

transmitters may use the same spectrum area by interlacing the "mark" and "space" signals. The FSK method the RF carrier is shifted a fixed amount so that the two frequencies represent the open and closed condition of the D.C. line. Usually a polar relay is connected in what is called a local loop so that it keys a frequency shifting circuit when the keyboard of the teletype machine is operated. This causes a series of frequency bursts which coincide with the code combination of the character touched.

The "FSK" signal is received by using a local oscillator or "BFO" to beat against the RF signal (or the "IF" conversion of the signal) . . . This "BFO" is tuned to a frequency which is 2125 cycles or 2.125 kc higher in frequency than the mark RF frequency, the resultant beat is an audio tone of 2125 cycles when the mark frequency is on and a 2975 cycle beat when the space frequency is on. These audio tones are then fed into the receiver converter in the same manner as the AFSK signal . . . In order for these audio notes to be correct and not "upside down" the RF frequency must be low for space and high for mark. A good way to remember is LS/MFT or "low space means fine teletype."

Just after the second world war a large number of Model 26 teletype machines became available when the use of this machine was discontinued by the telephone company and the wire services. The Model 26 was a cheaply built war expedient to substitute for the earlier Model 15 when the armed services took all of these superior Model 15 units.

The Model 15 later became more and more available to amateurs. "Ham" RTTY was born as the result of these available machines and the FCC modified its amateur regulations to provide for the new F-1 type of signal. The AFSK method is now also legal in some of the high frequency amateur bands. The FSK method is permitted in the lower frequency ham bands.

At the present time there are about 5ØØØ hams who have some "RTTY" equipment on the air.

"RTTY" is the ham abbreviation for radioteletype.

The "MARS" organizations use the "RATT" designation.

The word teletype is the trade mark of the Teletype Corporation and should not be used as a general term.

The Teletype Corporation has kindly furnished a quantity of a booklet called "The Teletype Story" which is yours for the asking if you have not already taken a copy. Also are some keyboard charts as well as some code cards of the Baudot code as it is used in the three types of RTTY keyboards.

This concludes the formal presentation for today.

There are several sources of information on "RTTY."

The monthly bulletin "RTTY" published by W6AEE, Merrill Swan, 372 West Warren Way, Arcadia, California. Cost, $2.75 per year.

The "RTTY Handbook," published by Wayne Green and Byron Kretzman, (RTTY editor of "CQ.")

"CQ" Magazine has a regular "RTTY" section and "QST" sometime has an "RTTY" article.

The ARRL Handbook has a short mention of RTTY.

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For Traffic Net Information:
W6FLW W6IZJ
For "RTTY" Information:
W6DEO W6CG W6AEE

THE ELECTROCOM INDUSTRIES MODEL FSC-250 FREQUENCY SHIFT CONVERTER

BURT JAFFE, K9BRL

The increasing RTTY activity on the low frequency amateur and civil defense bands during the past few years has created a need for a complete radio teleprinter terminal unit designed specifically with amateur and C D operating requirements in mind. The few quality, high performance units available have been designed primarily for commercial and military communications facilities and do not contain all of the features desired for amateur and C D operation. Furthermore, the price of these units starts at about $500 and increases from this amount. In most cases this price does not include filters which are so important for optimum operation within our crowded amateur bands.

With this in mind, an investigation was started into the best circuitry and features for this type of converter. For a couple of years various circuits were compared for performance, ease of operation, stability, and cost. The FSC-250 is the final result of this evaluation. The performance of these circuits was evaluated extensively on amateur bands under all types of conditions experienced on these frequencies. While many circuits will give excellent performance on high powered commercial stations which have little interference on their channels, more exacting designs are required to give optimum performance on the crowded ham bands where low powered stations, high noise level, and fading are common.

Based on the above evaluation, the following basic items of design were established:

(1) An audio tone type of converter so that it may be used with all types of communication receivers without modification, and may be used with afsk as well as fsk systems.

(2) The use of selective filters for the detection of mark and space signals rather than a linear discriminator circuit.

(3) An accurate and rapid method for indicating correct receiver tuning.

(4) A monitor for setting and determining correct transmitter shift adjustment.

(5) Electronic keying throughout—no relays used in the receiving system.

(6) A method of adjusting the mark-space bias ratio in order to improve the range on distorted incoming signals.

(7) Completely self-contained power supplies. No additional units required to place system into operation.

(8) Power supply adjustable from 20 to 70 ma. to accommodate any of the standard teletypewriters.

(9) Mark only or space only operation available in event of signal loss to one of the channels.

(10) Automatic teleprinter starting (auto-start) operation for long periods of unattended operation.

(11) Mark lock operation to prevent machine from running "open" during long space signal or signal loss. This feature is also useful in keeping the machine "marking" during periods of c w identification.

(12) Quality construction and stable components to provide long term trouble free operation.

(13) Light weight, compact, self contained assembly which is easily portable and may rapidly be connected to existing equipment.

The importance of good filters cannot be overemphasized for optimum of an RTTY converter. Many exhaustive measurements were made on simple discriminator circuits versus filter type discriminators and detectors. All of these measurements showed improved performance with properly designed filters, particularly when signals were weak and interference was present. Unfortunately, good filters are expensive and a considerable savings could have been accomplished had the degree of performance desired been obtained without their use. Not wishing to compromise performance for cost the decision was in favor of good filters. Not only is the filter design important, but the keying stages which follow must give proper bandwidth considerations. These filters also provide an accurate method of tuning in the fsk signal particularly if a single peaked response is designed into them. To have an accurate presentation and long term stability it is likewise important to use filters which are stable and unaffected by signal leakage around the filter and by variations in wiring capacity; problems common to high impedance filter sections. For good crossmark presentation on a two inch scope monitor 40 db. of adjacent channel attenuation is desirable.

Considering the above factors, 600 ohm, precision tuned, hermetically sealed toroidal filters were chosen for this application. The 3 db. bandwidth for these filters is 250 cps. This bandwidth appears optimum and allows sufficient reconstruction of the square wave keying of the tty signal when combined with the keying circuits which follow. This combination will accept keying over a bandwidth of 350 cps for each channel frequency. The nature of the balanced keying circuit, however, will allow signals close to the peak on the filter response to predominate during periods of interference. Since optimum performance with this type of system requires different filters for narrow shift as for wide shift, the filter units were made as plug in assemblies. Hence, if a 425 cps or 170 cps shift system is desired, other filters may be plugged into the converter. With the filters supplied the unit will accept keying of 850 ± 350 cps. Narrower shifts may be copied in the mark or space only positions of the channel selector.

Another item of much discussion and controversy is polar keying (where a signal on both mark and space frequencies is required) versus semi-diversity keying (where a signal on only one of these frequencies or on both will simultaneously key the converter.) It is our experience that during most conditions encountered in amateur low frequency circuits that the polar type of keying system gives improved performance. This is particularly true when noise, nearby channel interference, and severe fading are present since these may present unwanted keying information and cause misprints when a semi-diversity system is used.

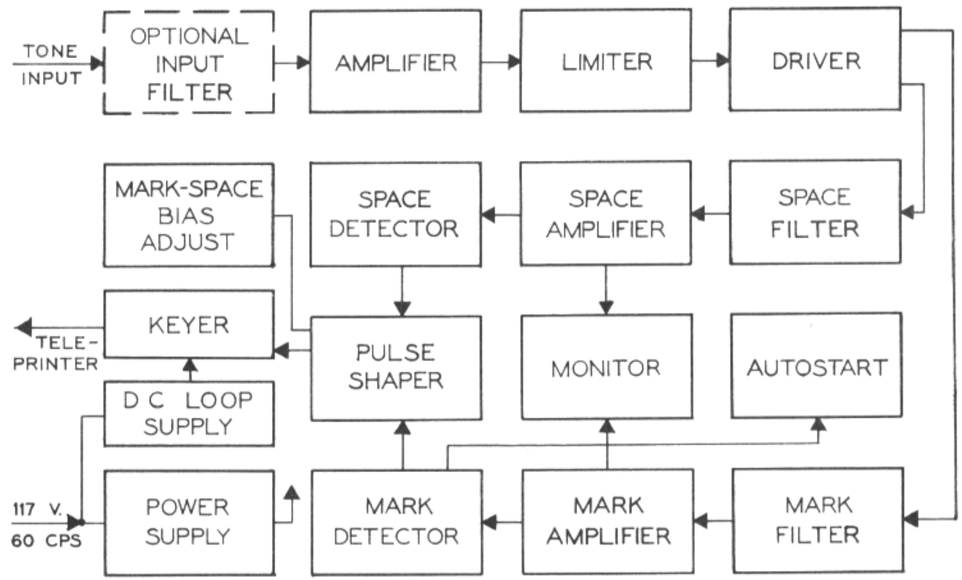
A flip-flop circuit was found to give the best polar operation without complex circuitry. This electronic pulse shaper acts in a similar manner to a polar relay yet does not have the maintenance and adjustment headaches common to mechanical devices. The omission of keying relays also removes a source of r f interference which often plagues radio receiving systems.

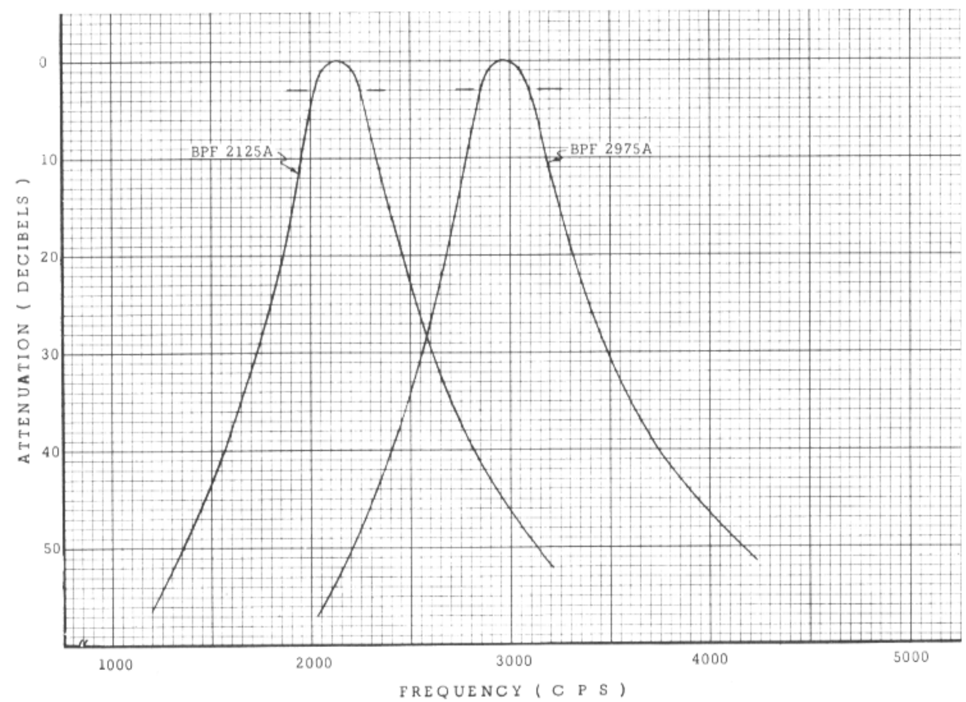
Autostart and mark lock operation both utilize the same circuitry. Upon a continuous mark signal of approximately one second, a motor control relay is energized and all keying circuits are operative to the teleprinter. Upon receipt of one second of space signal the relay releases and turns off the printer. For mark lock operation the printer motor may be left running and the d c loop will remain in a marking condition. When in the autostart position the motor is normally turned off and the d c loop is opened so that there is no current flow during long periods of no incoming signal to the machine. For unattended autostart operation the scope monitor is also turned off to prevent burning a spot on the center of the CRT in event of no signal input over extended periods. Mark lock is particularly useful during c w identification for holding the printer in a marking condition provided the station ID is sent either on the space channel or a few hundred cycles off of the mark channel.

The keying selector also provides for reverse keying in the event the incoming signal is inverted. A "local" position of this selector disables the keying circuits from the loop, and allows the d c loop to be used for local typing on the teletypewriter.

Various methods of monitoring incoming signals have been devised and tested. With the use of precision filters we believe the scope crossmark presentation to be the most accurate and quickest means of tuning in an rtty signal. Magic "eye" tubes or meters do not have the definition combined with the speed of tuning that a scope presentation allows. By using the filters that are also used for receiving it is possible to see exactly what kind of a signal is present on the keying circuits and place the incoming signals in the most desirable portion of the filter passband.

Terminals are brought out on the rear panel for the attachment of external keyer circuits should an installation require isolated loops for different machines. As an example, one might run a 20 ma. loop from the converter to a printer and an external 60 ma. loop to reperforator. In this manner the reperforator may print incoming signals from the converter or be switched to its local loop for perforation of tape. Terminals are also provided for connection to transmitter keying circuits in a duplex, half duplex, or retransmit configuration.





We have attempted to describe some of the considerations and design features of the FSC-250 converter. Let us now examine the block diagram. Figure , so as to better understand how these features are incorporated circuit-wise into a complete converter. The tone input from the receiver may be fed through an optional input filter as shown for the purpose of removing any signals the harmonics of which may cause interference to the mark or space channels after limiting takes place. It also serves to attenuate signals near the mark and space frequencies so that they will not feed into the limiter and desensitize it towards the radio-teletype signals. The effectiveness of this filter depends upon the amount of interference present and upon the communications receiver with which it is used. If sufficient selectivity can be built into the receiver, then the usefulness of an input filter is reduced.

Since an input filter is not required for excellent performance of the converter and because of the additional expense of such a filter, it was decided not to include this filter with the FSC-250. Also the type of filter desired for various types of receivers varies; hence, different filters are available depending upon the type of communications receiver to be used. The best over-all receiving combination may consist of a receiver using a 1.5 kc. mechanical filter in which case a bandpass input filter would have little to offer since the mechanical filter would attenuate frequencies outside of the passband of the mark and space channels. However, interference occuring between the mark and space frequencies could still capture the limiter and desensitize it towards the rtty signals. One thought on removing this type of interference on some receivers is to use a rejection tuning control or Q multiplier to place a notch between the frequencies. This technique seldom proves satisfactory since (1) the skirt selectivity of such a notch is usually not sufficient to prevent deterioration of the rtty signals, and (2) the ability to set the notch accurately and mainain its setting within the i f passband of the receiver is extremely difficult. To cope with this situation a notch filter, BSF 2229J, is available which will give over 50 db. attenuation to signals occurring between the mark and space channels. By the use of this stable, fixed band reject input filter at audio frequencies an effective notch can be maintained without affecting the rtty signals. For receivers not having the selectivity available with an i f filter, various bandpass input filters are available which will give a filter characteristic similar to that obtained with a filter in the receiver.

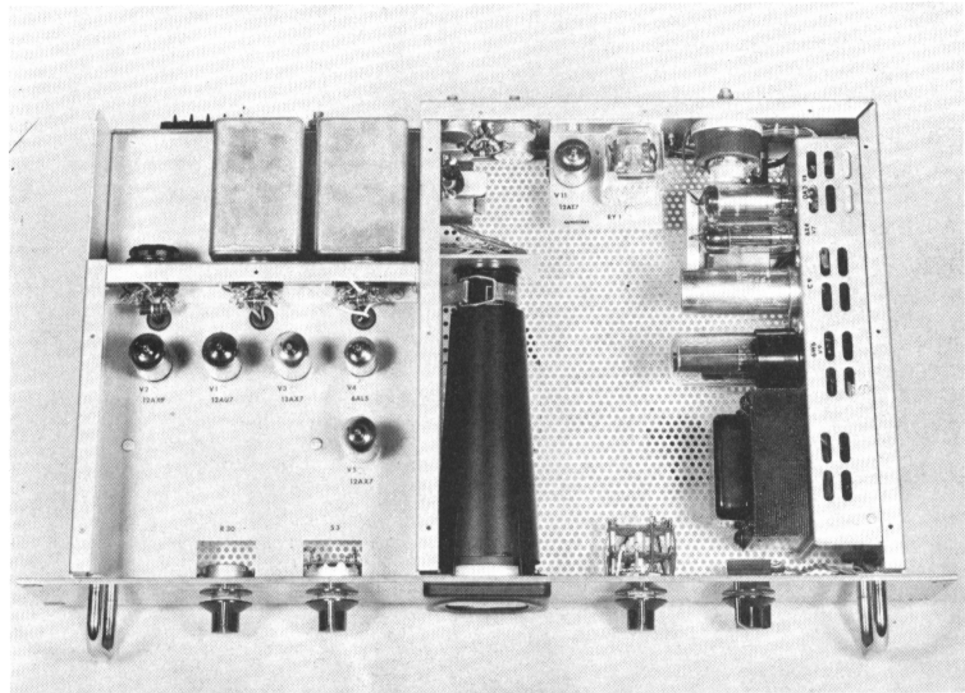
The incoming tone signals are next amplified a sufficient amount to saturate the limiter stage which follows. Two triode sections are used in a cathode coupled limiter circuit. This limiter provides a constant output voltage amplitude over a wide range of input variations. Therefore, the output variation of the limiter is one of frequency only. The limiter also serves to reduce the effect of noise on incoming signals. In this manner the advantages of a frequency modulated system may be maintained. Inasmuch as the characteristics of toroidal cores vary somewhat with different driving levels it is also important to maintain the proper level into the filters. Here again the limiter plays an important roll by providing this constant level.

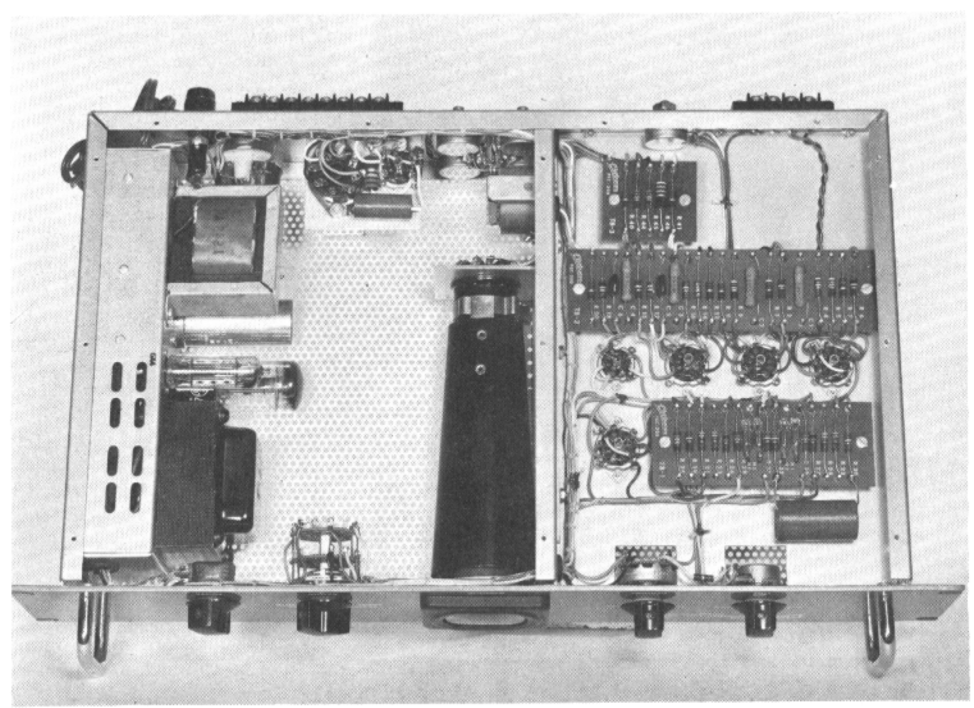
The driver stage is a cathode follower which serves as an impedance matching device suitable for driving the mark and space filters. A balance control is provided in the output of this circuit in order to adjust for equal mark and space signal currents.

The mark and space filters which follow allow only the correct tones to pass into their respective channels. Frequencies outside of the passband of these filters are attenuated thereby preventing them from operating the keying circuits which follow. These filters have already been described. Their response curves are shown in Figure

The voltages out of these channel filters are next amplified, and fed to the monitor and detector circuits. These voltages give a visual scope presentation of the placement of the incoming signals with respect to the passband of the filters.

Two diode detectors rectify the mark and space tone voltages. The currents through these detectors are controlled by the associated RC circuits to provide proper triggering voltages for the pulse shaper which follows. These voltages feed opposite sides of a basic Eccles-Jordan flip-flop circuit. This circuit acts in much the same manner as a polar relay. The incoming mark signal will cause one tube to conduct and remain conducting. Upon removal of the mark signal, a space signal feeding into the other





tube reverses the action. The triggering point of each tube may be adjusted with the "bias" control. For zero bias operation this stage operates in a balanced manner. For mark or space only operation this stage is biased to return to the opposite condition from that of the operating channel, thereby accepting make and break signals. Since the on-off transition of this stage is an abrupt one, the output to the keyer approaches a square wave.

The output of the converter is a separate DC power supply which is keyed by a 6W6. This tube is operated either at zero grid voltage or at cutoff. In this manner the keyer tube either opens the loop for a space condition or closes it for a mark condition. The loop current is adjusted by a rheostat which is in series with the loop power supply. This supply uses a silicon rectifier. Other built in supplies power all of the converter circuits and the scope monitor.

The autostart detector and control tube obtains signal from the mark detector circuit. Time constants in this circuit are chosen for a pull in and release time of approximately one second each.

Figures , , and show the construction of the FSC-250. Quality commercial terminal board construction is utilized. All components are easily accessible by removing the bottom cover. Tubes are all accessible by removal of the top cover. The cabinet is aluminum with irridite finish and the front panel is grey hammertone with white figures. The complete unit weighs only 14 pounds.

Reports received from units now in operation have all been very favorable. They indicate superior over-all performance to many commercial and military converters now in common use by amateurs and civil defense installations.

The Electrocom Model FSC-250(CD) meets all requirements of CD-I-100-E20 and is approved by the OCDM for federal civil defense matching funds.

The FSC-250 Frequency Shift Converter is manufactured by Electrocom Industries, 1105 North Ironwood Drive, South Bend 15, Indiana. Inquires or additional information may be obtained by writing the manufacturer.

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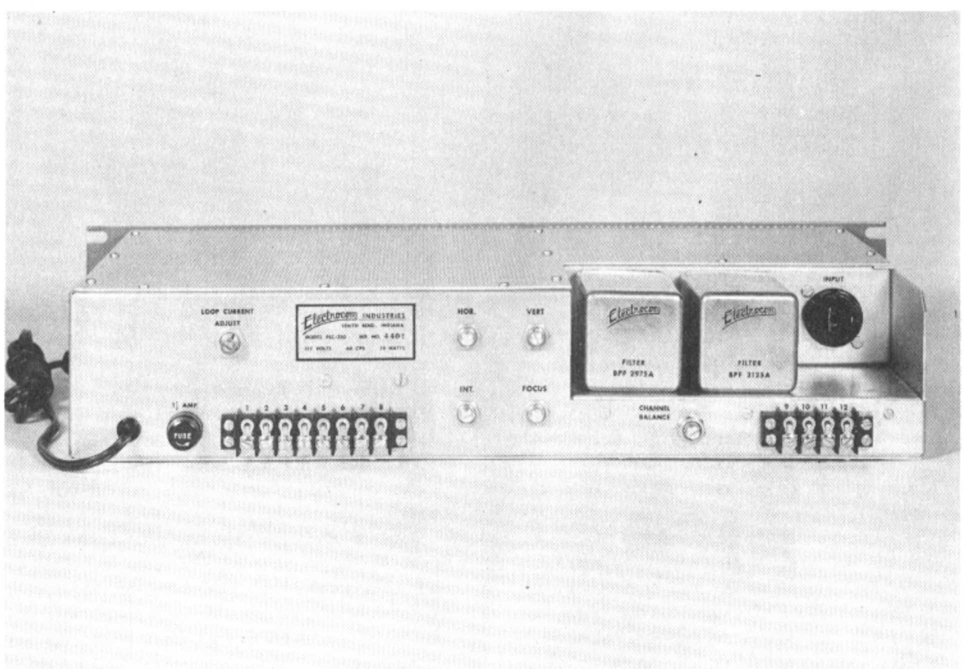

RTTY-DX

BUD SCHULTZ, W6CG

5226 N. Willmonte Ave., Temple City, California.

Ye olde Chief Editor (W6AEE) with his long black moustache waving in the breeze and with his bull whip in hand has just informed (?) me that its time for another DX round-up so here is this month's accumulation. Three long Airmail letters from HL9KT attest to the interest in RTTY at that rare DX outpost. Here's a quote from one of em; "You might pass the word and see if any of the RTT fiends would like to arrange a sked and try to work us on 20. Equipment here is a BC610, an R-390/URR receiver which is more or less a military version of the 75A-4 designed for RTTY, a CV-116 converter (Hoffman labs) that will copy even the most sick, sick, sick RTT signal and an O-39C FS exciter with a TT-4 machine. . . so let us know." Efforts are under way to set up a sked so you DXers can get a crack at him but so far the only remaining snag is official sanction by the Korean Ministry of Communications. As soon as this is settled HL9KT will show up on 14090 Kcs. so keep your ears peeled. Doc Gee, G2UK, informs us that he is delivering a paper on "RTTY" before the joint RSGB-IARU meeting in London this month. This is the first official recognition of RTTY operation by either of those august bodies and is a big step forward for our cause. Doc reports a fine personal visit from K6OEK, another Temple City teletyper. When last heard from, K6OEK was heading for a personal visit with Jan, PAØFB—Lucky guy!! Speaking of PAØFB—Jan reports the weak spot of his operations is in his TU. He says the CW QRM is spoiling lots of his copy so he is going to improve the converter by the addition of some improved filters. Jan still maintains his skeds with the lads across the channel and continues to show up for an occasional QSO with the W gang.

My European correspondent, G3CQE, really came thru with lots of info this month. Bill says he is still trying to get ZS1FD and ZS6CR straightened away on FSK. Both are very anxious to get underway but are really having their troubles collecting enough gear to put the finishing touches to their RTTY set-ups. Bill also says not to write ET2US off as a good "possible." It seems ET2US has a complete RTTY station but is layed up in the hospital at the moment. He is expected back on the air soon. Arthur, GW2FUD is running a full head of steam over his FSK prospects and should be on the air by the time this gets in print. G3BST is on quite regularly and keeps skeds with G2UK on 3.5 Mcs. A sizeable number of commercial TU's have been recently released in the UK for a very reasonable price and this has really helped to spur interest in RTTY. Imagine buying a brand new discriminator type TU, 19 inch rack mounting, complete with relays for about ten bucks!! According to G2UK the English lads are snapping them up like hot cakes!! Bill, G3CQE, has been approached by a British Short Wave Publication to write a monthly article on RTTY—this is a real "break-thru" for the FSK cause. Bill still continues to pound in on fifteen meters here on the West Coast and frequently his sigs can be copied as late as 2330 GMT.

The predicted flopperoo of the fifteen meter band has so far failed to materialize. The regular weekly skeds with Eric, VK3-KF, and Alec, ZL3HJ continue without a break. Each weekend finds their signals getting stronger—at times they bend the pin on the old 75A-4!! They can be found—along with Bruce, ZL1WB, around 21,085 from about 0200 GMT until 0500 GMT. Try it some weekend and give yourself a treat. Eric is busy writing some technical articles that will appear in future issues of "RTTY" and Alec finds his ranch keeps him pretty busy but finds time for frequent trips to the ham shack to look over the FSK freqs. Bruce, ZL1WB has been as regular as a clock on both bands with his usual fat signals.

Saddest story of the month comes from Dick, W7LPM, who finally cornered ZS6CD and talked him into switching to FSK after hooking him on SSB. Things were just going great on RTTY and Dick was copying ZS6CD in fine style when the band folded up like a wet paper sack before he could get in a return transmission. Dick still needs Africa for WAC-RTTY!!! He also reports the TU parts he shipped to VS6AZ have not arrived there yet. VS6AZ has had a few one-way RTTY QSO's with some of the Stateside gang but is very anxious to complete his new TU so he can really get under way. And speaking of shipping TTY parts to the DX gang; the big shipment of toroids that Bob W6NRM shipped to the English lads arrived in good shape and really were a big "boost" to the RTTY morale over there. One of the requirements to obtain a set of toroids, as set up by the G boys themselves, is that the recipient must write Bob a letter of appreciation. This seems like a very novel arrangement to this Editor but when I think of all the letter writing Bob is going to have to do in the next few months I sure hope he has a good typewriter ribbon. W6NRM along with W6OWP, W6VPC and some of the others have completed the fine project of getting a printer down to VK3KF. Nice going fellers!! W6MTJ sends word to his DX friends that he isn't among the "Silent Keyboards" but he is busy setting up the stuff in a new hill-top location in Mill Valley.

The Yasme DX-pedition is now in full swing and so far has operated from VP5-VB and HKØAA but was not able to use RTTY at either spot. At the first location the boys were unable to get permission for RTTY and at the HKØAA spot it was just too rough trying to get anything but the bare necessities ashore. They are hoping for better luck at some of the future locations. Future places being eyed by Danny—Dave and company include Malpelo, The Galapagos Islands, Clipperton, and perhaps the Marquesa Island Group. They are hoping to use RTTY from some of these spots. (Amen!!)

In closing this month I would like to report the return to active circulation of the "DX BULLETIN" edited and published by Don Chesser, W4KVX, after the disastrous fire of last November which completely wiped out this fine publication. Don has always given more than generous space to any RTTY DX news in his columns and it is with a great deal of satisfaction that we welcome him back to the "active" list. Congratulations, Don.

CU all next month—73.

Bud, W6CG

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MACHINE TELEGRAPH

At the keyboard of the mighy Buckingham, the Western Union Telegraph Company came up with a smash hit to the tune of 2,429 words transmitted in 23 minutes and 24 seconds. A record! The traffic over the C. L. Buckingham system of machine telegraph in use by Western Union on their New York-to-Chicago circuit, was received page-printed directly on telegram blanks for immediate delivery. It happened in the year of our Lord, 1904.

J. A. Chumley
24540 E. Little 3rd St.
San Bernardino

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WIZARD OF MENLO PARK

Thomas A. Edison was born of Canadian parents, on February, 1847, in Milan, Ohio. In 1868, he invented an electric "Vote Recorder" which he demonstrated to congress. Congress rejected it.

Edison invented, installed and operated an electric stock ticker for use on the Boston Gold Exchange serving forty broker-subscribers. Also during this same year the inventor delved into an enterprise of duplex system of telegraphy which ran him over eight hundred dollars in debt.

Broke and still in debt, in 1869, Edison arrived in New York by steamer from Boston. After two interviews with an official of the New York Gold Indicator Company, Edison was employed as supervisor of that company which served over three hundred brokers.

In October, Edison joined forces with Franklin L. Pope and opened an electric engineering firm in Elizabeth, N. J.

Between 1870 and 1876, Edison perfected several systems of wire telegraphy, including his own system of high-speed PRINTING TELEGRAPH. This system printed the traffic in large Roman letters.

Later, the Wizard of Menlo Park was called on by General Marshall Lefferts, president of the New York Gold & Stock Exchange to rehabilitate and improve the exchange's complete system. At the completion of this undertaking, Edison was given large orders for the Edison-improved versions of ticker equipment and was paid off in cash with forty $1000 dollar bills.

J. A. Chumley, W4FEE/6
24540 E. Little 3rd
San Bernardino

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NYC/BOSTON RTTY DINNERS

Sorry to be a bit late sending you the list of the Boston and NYC affairs . . . Kinda missed some of the "old gang;" had to stall off while ole Ricardo, W3CRO, got some reprints made of the pictures that he took—in color, and to get some black and whites out of 'em was not very successful as you can see.

Dick and I had a fine time at Boston, where we yaked at great length on converters ect. . . Been off of twenty for a while since the beam broke up during the recent storms. Hope to run into you soon, either on the air or in person. Don't forget if in the area, please give me a call.

— 73, Phil, W2JAV

Here is list of attendance at the RTTY dinner in Boston on March 19th, 196Ø:

W1RUU—Robert H. Strid
W1CKJ—Jesse O. Richardson
W1JTL—Robert G. Armstrong
K1IZU—Benjamin K. Rush
W1FGL—Al Hughes
K1DSW—John Milne Jr.
W1PBS—David A. Hinkley
W1HGH—James H. Hankins
W3CRO—Dick Urian
DL4ZV—(Represented by ??)
W1QPM—Richard L. Miller
W1FOX—Leo L. Martineau
W1BGW—Jack Berman
W1IBY—Herbert W. Gordon & XYL
W1YYZ—George Foley
W1ITU—Louis H. MacDonald
W1AFN—Tom Howard
W2JAV—Phil Catona
W1FVM—H. Corwin Miller

—L. Cuoco

List of those attending the New York RTTY Dinner on March 21, 196Ø:

W1EVZ—James W. King
W1FGL—Al Hughes
W2ZKV—Felix Esteban
W2TFM—Carver L. Washburn
W2ODA—Carl Daniels
W2ATQ—Walt Grosselfinger
W2UAE—Don Field
W2UFU—Russ Spera & XYL
W2ZXM—Capt. Kurt Carlsen
W2DB—Howard Cervantes
K3CWK—Ralph Mullendore
W3ILW—Herman Wyman
K3GCI—Russ Scheller
W3PYW—Frank White
W6CND/WA2CBX—Ed Hitchcock
W9GQI—Bill Butler
W1FVM—H. Corwin Miller
W1IYU—Louis MacDonald
K2YEL—Bob Jose
W2TOX—Caird R. Clements
W2AKE—Andy Stavros
W2TAM—Ray De Vos
K2KRC—Frank Bremer
W2AVI—Bill Kunzler
W2PEE—Elston Swanson
W2WRI—John Kammerer
W3ZOE—Joe Forditch Jr.
K3IUV—Bert Soltoff
W3TUZ—Frank Van Brunt
W3FMC—Fred Albertson
W6GFY—John Van Gross
W9GLR—James Card
W1AFN—Tom Howard
K1MAM—Stan Butryn
W2JAV—Phil Catona
W2KDW—Don Scher
W2ANB—John Langley
W2TQI—Bill McGrath
W2EBZ—Clay Cool
K2AAA—Don Merten
W2TKO—Roy Weise
WA2ELK—Bill Mead
K3BEG—Cyril Hill
W3CA—Ken Speer
W3CRO—Dick Urian
W3OB—John McKinley
W8IRM—John James
W9DYV—Wes Schum

Remote Diode Tuning for the FRR3 Receiver

V. A. JUPE, WØOKH, Phillipsburg, Kansas

Since I must be lazy by nature, it irked me to run across the shack to twist the VFO slugs on my FRR3 when the signal was just out of range of the AFC unit. A faint memory of an article I had read about remote diode tuning stirred me into looking thru many copies of CQ and QST until I came to W6NRM's article in April, 1952 CQ on the "Useful Diode Modulator." Later, I discussed the idea with Bob during an RTTY contact. He seemed to think it would work and cautioned against applying too much voltage on the modulator or it might start reverse shift.

FIGURE 1

My unit is an FRR3 but this is also applicable to the FRR3/A.

The 100K pot may be placed at operating table and connected with two-wire shielded line to the receiver rack. The .01 Disc ceramic is placed at the diode tuner input to keep local RF out of tuner. The diode tuner may be built up on a 3 or 4 lug terminal strip and ground lug is bolted to the case ground screw found under the HFO in the "Oscillator Unit" of the FRR rack.

Point "A" is connected to the lug on L36 where the Red wire carrying 150 Volts regulated comes to the HFO on the FRR3. It should be connected to the junction of R10-7B (500 ohms) and C52D (.002) on the FRR/3A.

Point "B" is connected to pin #1 of the 6sn7 high freq. oscillator on the FRR/3. It is connected to Pin #4 of the HFO on the FRR/3A.

Arrange terminal strip so point "B" lead to HFO is short and rigid.

The tuner tunes the 2-4mc oscillator about 15 kc. The amount of tuning on 40, 20, and 15 depends upon the amount of multiplication of oscillator in the FRR3 "multiplier" which is 2, 3, 5, and 7 times. This gives quite a tuning range on 20 and 15 but does not seem to make zeroing a TTY signal into TU anymore work.

In use, I set the 100K pot to top and set oscillator VFO slug to highest frequency I want to tune. Then, as pot is rotated to ground, the receiver frequency is lowered. The AFC in the AN/FGC TU is rather slow acting so no interference with tuning action has been noted.

The receiver stability is not effected by addition of the tuner. I tried using a 6C4 tube instead of the diode with rather bewildering results. On a steady, stable signal from Frequency Meter, I could note a rhythmic change in beat note. This was traced to AC line voltage changing at this rate because of an excess number of electric oil-field pumps being on at the same time. I discarded the tube because the minute change in filament voltage was causing the frequency shift.

I am well pleased with the diode tuner and find that it is easier to tune a signal with it than with the best vernier dial I have ever used. There is no backlash. It works well on SSB and CW, too.

(If you think of interest to anyone, Merrill, here is some other things I have applied to the FRR/3-FGC combination.

1. For local "on the air" monitoring of shift and copy. Place a large 1-O-1 ma meter connected to external meter terminals on FGC; a dial for remote rcvr control, and the diode tuner pot and dial switch on a panel at operating position.
2. In "A" receiver, open wire to relay contact which shorts receiver output and install 1000 ohm pot in series with it to adjust "on the air" audio output. Pot may be installed in relay box cover in right rear corner.
3. *Do not* connect "FGC disabling" circuit. This leaves printer in operation during transmit. I have a switch at operating position which disables FGC when I want to tune or someone uses regular cw for I.D.
4. Find an extra set of relay contacts in your "transmit" control and wire across the "Send" position of remote dial switch. This will operate antenna grounding relays when you send but you will have plenty of signal for monitoring.
5. Be sure AVC action of receivers is the same or your signal may cause blocking. If this occurs, "Diversity" switch may be turned off without effecting operation very much.

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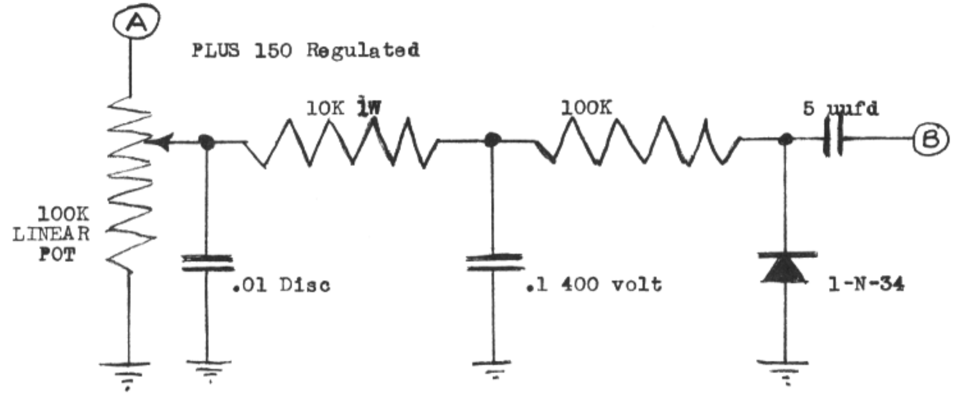

FIGURE 1

PAØ FB