RTTY

NEWS OF AMATEUR RTTY

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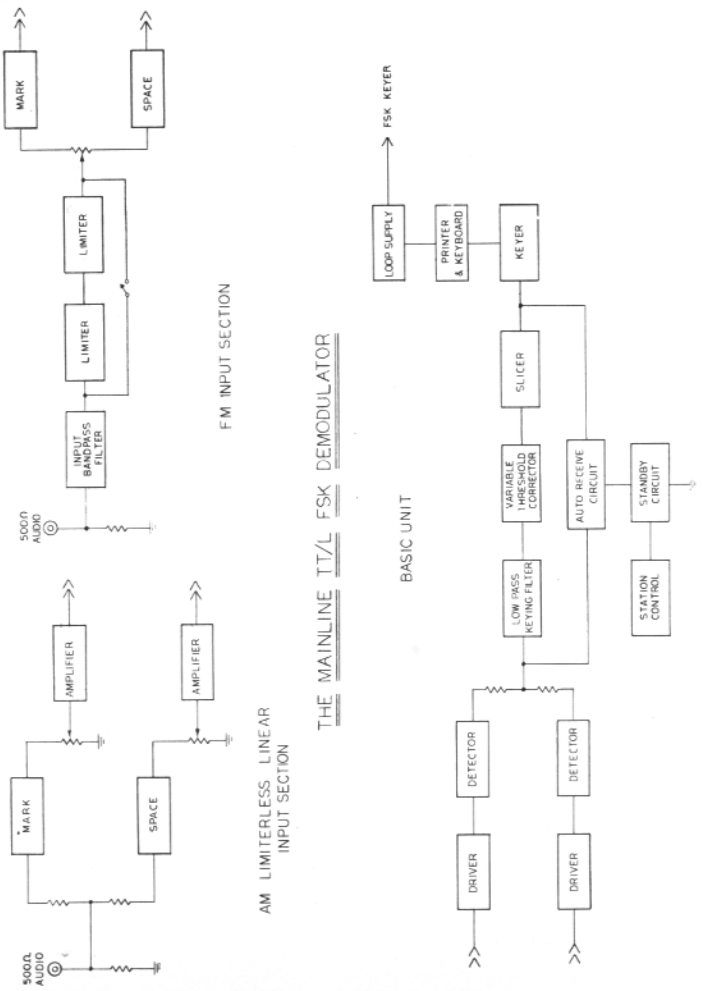

HORSE TRADES

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.

FOR SALE: Matching Gear and motor pinion sets for any 15, or 14 reperf. 60 or 75 speed—$3.00 postpaid. W9YVP, 11001 South Pulaski, Chicago, Ill. 60655.

FOR SALE: 1—14 Typing reperf, new keyboard and end of line indicator,$60.00. 20 rolls tape. One 2B Western Union tape sender $25.00. One CV/57 unit, all plugs $85.00. One MM2 Scope, new $60.00. Will deliver within 100 miles. W8CFT, 1758 East Mound Street, Columbus, Ohio.

FOR SALE: Typewriter Ribbon Re-inkers, $3.00 Postpaid Continental U.S.A. Walter E. Nettles, W7ARS, 8355 Tanque Verde Road, Rt. 2, Box 694R, Tucson, Arizona 85715.

WANTED: In order to complete files need the following back issues of the RTTY BULLETIN; February 1953, April 1953, May 1953, August 1953, October 1953, November 1953; January 1954, May 1954, and July 1954. Will buy or trade. Have back issues of the C-D CAPACITOR and AEROVOX bulletins. W2TAM, 140 Summit Avenue, West Trenton, N. J. 08628.

FOR SALE: Kleinschmidt TT-4ATG lightweight page printer. Recently had complete overhaul, $100.00, also model 14 TD unit $50.00 F.O.B. Denver. K0ATZ, 2450 South Quitman Street, Denver, Colorado 80219.

FOR SALE: Or Trade: CV-57/URR converter, W5ZZV, 2401 Penna. Ave., N. W., Roanoke, Virginia 24017.
Surplus Teleprinter equipments, EUROPE and Great Britain. Send for list. P. Harris, ORGANFORD, DORSET, England.

FOR SALE: Model 26 machine, from Bell System, keys have been changed to be communications. Waiver required, $65.00. Working condition, excellent. Model 14 machine with keyboard perforator, power supply and small steel table, W/AC-DC motor $75.00, no waiver. Surplus Sig Corps. Model 15 machine with KBD, power supply and AC-DC motor, used with small steel table, and cords $85.00. Power supply, 2.5 KW 60 cycle, with Briggs and Stratton Type ZZ one cycle motor, Sig Corps PE-73-AC, Recently overhauled and reconditioned, clean rope start $300.00. W6DKZ, 4160 Holly Drive, San Jose 27, Calif. Phone CL 8-5413.

RTTY, INC.
372 Warren Way
Arcadia, California 91007
Return Postage Guaranteed

BEFORE THE

FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, D. C. 20554

In the Matter of

Amendment of Sections 97.9 (d) (1) and 97.27(a) of the Commission's Rules governing eligibility for the Conditional Class license in the Amateur Radio Service.

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DOCKET NO. 15640

NOTICE OF PROPOSED RULE MAKING

By the Commission:

1. The Commission has under consideration the provisions of Sections 97.9(d)(1) and 97.27(a) of the rules governing eligibility for the Conditional Class license in the Amateur Radio Service. These rule sections provide that an individual may apply for the Conditional Class license if his actual residence and proposed station location are more than 75 airline miles distance from any Commission Field Office or quarterly examination point.

2. Review of the present status of the Conditional Class license shows that there are now more than 40,000 holders of this authorization. Over 90% of these licensees established their eligibility on the basis of being more than 75 airline miles distance from a Commission Field Office or quarterly examination point. Almost without exception, these licensees obtained an authorization after passing a code test and written mail examination under the supervision of a volunteer examiner.

3. Conditional Class licensees comprise over 20% of all licensees who are entitled to the higher amateur operating privileges. While this percentage is not alarming, it is the result of a constant increase through the last decade. This the Commission does not regard as desirable since it is our policy that, where feasible, the qualifications of those applicants for the higher classes of amateur licenses be directly verified by Commission personnel.

4. Accordingly, the Commission proposes to amend Section 97.9(d)(1) and 97.27(a) to provide that only those individuals whose actual residence and proposed station location are more than *one hundred and seventy five airline miles* distance from a Commission Field Office, quarterly or *semi-annual* examination point shall be eligible for the Conditional Class license on a distance basis. It is not anticipated that these increased limitations will impose an undue burden upon applicants. There will be very few locations where potential applicants may have to travel more than 150 miles. Where travel conditions are difficult, such as in mountainous areas, there are almost invariably examination points well within 100 miles of potential applicants.

5. It should be emphasized that this proposed amendment does not in any way affect renewal by present holders of the Conditional Class license. Nor does the proposal affect eligibility for this class license on the basis of protracted disability, service in the armed forces or temporary overseas residence.

6. The specific proposed amended Sections 97.9(d)(1) and 97.27(a) are set forth in full in the Appendix to this Notice. The proposed amendment is issued pursuant to the authority contained in Sections (4(i) and 303 of the Communications Act of 1934, as amended.

7. Pursuant to applicable procedures set forth in Section 1.415 of the Commission's Rules, interested persons may file comments on or before November 16, 1964, and reply comments on or before December 1, 1964. All relevant and timely comments and reply comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision, the Commission may also take into account other relevant information before it, in addition to the specific comments invited by this notice.

8. In accordance with Section 1.419 of the Commission's Rules and Regulations, an original and fourteen copies of all statements or comments shall be furnished the Commission.

FEDERAL COMMUNICATIONS COMMISSION

Ben F. Waple
Secretary

Attachment: Appendix
Adopted: September 30, 1964
Released: October 1, 1964

continued . . .

THE MAINLINE TT/L FSK DEMODULATOR

Irvin M. Hoff, K8DKC
1733 West Huron River Drive, Ann Arbor, Michigan 48103
and
Keith B. Petersen, W8SDZ
4626 Rambo Lane, Toledo, Ohio, 43623

26. The Mainline TT/L FSK Demodulator

The word "demodulator" is becoming standard practice with commercial and military organizations. "Converters" are now often thought of with respect to units automatically changing Morse code to RTTY; changing 8-level to 5-level; changing 50 Baud to 45 Baud, etc.

This project grew out of dissatisfaction with conventional limiterless methods (even the TU-E which K8DKC called the TU-H after minor modifications) and the desire to incorporate the concepts outlined by Beard and Wheeldon;[12] Thomas;[7] the DTC circuit;[5] Poor;[6 11] and others.[2 3]

It was soon discovered that the demodulator would need provisions for both FM and AM detection.

As a result, the TT/L FSK Demodulator is perhaps the ultimate in versatility since it has a "basic unit" to which any type of input (FM, two-tone, narrow shift, etc.) may easily and inexpensively be added. This offers, at the same time, an excellent "test bed" for further development work—if comparative tests are to be made, they can then be made with the same unit, and a definite trend established.

If the basic FM with limiter section is added, the total unit is then called the TT/L version. If a limiterless input section is further added, it becomes the TT/LF. If, as a few might do, a heterodyne unit is added allowing variable shift with narrow filters, this is called the TT/LH.

At K8DKC, all three sections have been added (TT/LFH). The limiter section can be operated limiterless; giving three two-tone input configurations possible from broad-band to 70-cps Collins filters.

At W8SDZ, the basic TT/L is in use, and has been giving such excellent results (both on FM and with the limiter switched out for broad-band limiterless operation) that no plans at present call for additional input sections to be added.

Since completing this project, tests have been run at K8DKC on these various input units, utilizing an audio tape recorder. In general, it can be said that with the exception of nearby CW QRM when the 70 cps filters showed definite advantages, the limiterless so far has offered little advantage over the FM system. On the contrary, the FM system has quite often displayed better copy than the limiterless. This includes talking with weak European stations; static conditions; and in general, any conditions so far encountered. The FM section was being used with a receiver having a 2.1 filter and no band-pass input filter. The would place the FM section at its greatest disadvantage when one further considers that tones of 1275/2125 were being used on a linear discriminator.

Results so far indicate that if it were not for testing and occasional CW interference, the alternate limiterless systems would be seldom used. Further experimentation is planned.

We would therefore suggest that the basic unit with FM section be built and tried. (The FM section converts immediately to two-tone with operation of the limiter bypass switch.) This method allows quick and inexpensive adaptation to any type of input desired. It also allows an auxiliary FM unit to be constructed for any alternate shift desired; or interchangeable plug-in discriminator filters could be used.

27. The Band-Pass Input Filter

This was designed by Vic Poor, K3NIO, specifically for this demodulator. It is a 3-pole Butterworth type of slightly over 1 kc. band-width. It uses 88-mh. toroids, and proper capacitance values are made by paralleling several of the common values.

28. The Limiter

This is a 2-stage transformer-coupled system of zero-time constant characteristics for maximum protection against noise bursts, impulse noises, etc. It has about 50,000 times gain and limits down to –56 db. input. Normal input is 2-5 volts RMS at 500 ohms for optimum operation. It utilizes cascaded 6BN6 tubes which clip impulse noises instantaneously and symmetrically.

The 6BN6 is said to produce far better noise immunity than any other FM limiter.[20] One 6BN6 stage is said to be the equivalent of two normal limiter stages.

One does not want to use RC coupling between stages of a good limiter, as this inserts an undesired time constant.

A switch has been provided to by-pass the limiter for two-tone broad-filter operation.

29. The Filter Section

TV width coils were used as they inherently have low "Q", and make an ideal linear discriminator. Toroids can be used (Sections 6 and 8) but must be properly loaded. Both the 2125-2975 and the 1275/2125 filter sections were designed using a Racal digital audio counter, AC VTVM and audio generator.

For a number of reasons, the 2125/2975 filter section is superior to the 1275/2125 and thus only the one band-pass input filter was designed.

30. The Detector Section

This is a dual-detector with parallel combining. The extra detector section is used for:

1. Reverse operation;
2. The auto-receive circuit; and
3. Providing the indicator with optimum operation on narrow shift where normally the opposite channel leakage seriously affects results.

31. The Low-Pass Filter

This is our real "pride and joy" on this demodulator. It represents something of a milestone in amateur units. Other low-pass filters have been used, but little work has been done with LC filters. DL3IR[9] offered an LC low-pass filter, but the application was different and the cut-off frequency was much too high to be adequately effective.

This is a 3-pole Butterworth design and is isolated from the detector stage and from the variable threshold stage through cathode follower stages to keep constant impedance on the low-pass filter.

It was designed with the assistance of Dr. McMann of the University of Michigan and Dr. Joe Buck of Cal Tech in California. It was observed under actual conditions for correct "eye pattern"[11] by K3NIO at the Frederick Electronics laboratory. It is an optimum design and it is suggested that no substitutions of any sort be made UNLESS quite narrow channel fiilters are used. In this case, the 22K resistor R_{14} could be made larger (33-39K) to keep the total rise time of the channel filters and the low-pass filter within one bit-time.

This filter has a cut-off of 28 cycles.

32. The DTC/ATC Section

This is the variable threshold corrector circuit. A switch is provided for changing from DTC (open switch) to (ATC) closed switch). Normally DTC would be used, but for copying keyboard-speed mark-only, ATC will give best results.

This section is followed by a cathode follower section to keep the output of the DTC at very high impedance from mark to space; which would not be the case if fed directly into the slicer stage.

The time constants in the DTC/ATC have been quite carefully selected by exhaustive testing and should not be varied.

We recommend you make no attempt to improve this section, as shortening the time constants must be done symmetrically on the storage system as well as the disconnect system. This results in increased single-channel distortion. Lengthening the time constants results in less ability to follow the faster fade rates.

33. The Slicer

This is a trigger tube which changes output state on a very tiny input fluctuation—it will trip on about 30 millivolts. Since the input voltage will be about 50-55 volts with normal maximum input, this represents a post-detector dynamic range in excess of 60 db. This is of course exceptional, but needed for optimum limiterless operation in which the signal can easily vary more than 40 db. at the output of the receiver even with AGC in use. This circuit has regulated voltage applied to it as to all critical circuits to keep the slicing point constant for optimum operation. A single "set-and-forget" control on the slicer makes it a highly reliable, stable circuit.

34. The "OR" Gates

These provide a method of controlling the keyer tube either for standby or for auto-receive, and are regular computer-type gates.

35. The Keyer Tube

This is the well-known 6W6 circuit that has been in use for some time. We strongly recommend the use of 60 ma. circuits with the printer magnets in parallel. This provides one-fourth the inductive load offered by series connection, and the printer can close its magnets more quickly. The back EMF (inductive kick) will be only 50 per cent as great, putting less strain on the system. With a 60 ma. circuit, a greater number of machines can be placed in series for simultaneous copy.

36. Polar Relays

The use of polar relays is not recommended either for the printer or for use with the FSK system for the transmitter.

37. Mercury-Wetted Relays

These offer significant advantages over polar relays, but their use is also discouraged.

38. The FSK System

This is the regular MAINLINE FSK system. It utilizes the "saturated diode" concept for fixed shift. Once the trimmer capacitors have been adjusted for the shift desired, the keyer will retain that shift indefinitely. Two tiny keyers are suggested for most transmitters—one for normal shift and the other either for narrow shift or for use on those transmitters requiring inverted transmission on some bands, such as the HT-32 series by Hallicrafters, etc. If the shift is backwards from normal, reverse the direction of the diode. A similar system has been previously described in greater detail by K8DKC.[23]

The FSK system suggested also includes variable narrow shift CW ID.

The main power switch disconnects the FSK connection to avoid the possibility of hum loops to the transmitter for voice operation when the TT/L Demodulator is not operating.

39. The Indicator System

There are many different types of indicating systems. The most common is the "+" display which is connected to the mark and space filters. There is the "flipping line" display in which a DC-coupled scope such as the "Oscilloanalyzer"[21] is connected to the output of either the low-pass filter or detector circuit. Such a display is offered on many military converters. There are neon bulbs as in the W2PAT circuit[22] and dual-eye indicator tubes as in some versions of the Altronics-Howard commercial units.

Other types of indicators are generally unfamiliar to amateurs. Some of these include displays for commercial "Twinplex" signals, etc.

When using a linear discriminator, one seldom gets straight lines for the usual "+" scope display. Weitbrecht showed typical displays in his Mark IV converter article.[17] However, as soon as one leaves 850 shift very far, the ellipses become so distorted that one has little idea what mark and space should then resemble. It erroneously gives one the impression the unit will not work on those shifts.

Some converters use extra tuned circuit just for the scope presentation. These give sharp, straight lines, but as one goes toward narrow shift those displays all but disappear; again giving an erroneous implication that the converter is marginal on a narrow shift.

With a good linear discriminator and lots of post-detector dynamic range, very narrow shifts could be rather easily copied if the indicator system was adequate.

This called for a new approach to the indicator problem. A system was developed that we call the "minus-minus" system. Since mark and space are never present at the same time they can be alternately displayed on the SAME display—thus our system is really a direct-reading voltage comparison system. A meter could be used, and in fact, will be in a transistorized version using a similar concept.

While receiving RTTY signals, if mark and space are equal at the detector stage, no variation on the indicator is noticed. If they are unequal due to various reasons such as mis-tuning, this display will show a variation. By careful selection of an eye tube with (1) lots of gain, and (2) short-perseverance phosphor, quite accurate tuning can be readily accomplished. The closer one gets to correct tuning, the less the eye flickers. Thus the action is rather logarithmic. There is enough gain in the circuit that the indicator gives excellent results on quite narrow shifts by merely opening the gain pot accordingly. As this system is linear, shifts from less than 170 to 850 cps can be accurately read directly off the dial; once calibrated.

A simple RC low-pass filter is included at the grid of the indicator tube to keep the rectified audio output of the detector from affecting the indicator's presentation.

Most "straddle-tune" indicators require reception of RTTY for accurately tuning in the signal. "Send me a line of RYRYRYRY's" is a typical statement when switching to narrow shift. This indicator can be used to immediately tune a station suspected of being on narrow shift with nothing but his mark carrier! Set the knob to correspond with 170 shift; tune the signal for normal eye closure and wait for his FSK signal to commence. A minor adjustment can then be made, but the tolerance of the system allows immediate copy.

Although oscilloscopes have been considered a "must" item in the past, this simple and inexpensive system actually gives superior results ot most scope circuits; particularly when used for narrow shift.

40. The Auto-Receive Circuit

One of the most enjoyable aspects of RTTY is the ability to have the machine work satisfactorily whether it is watched constantly or not. On the other hand, one of the most exasperating features is the need to be present when the station finishes; particularly if one is just "copying along" and not in the contact.

As a result, one of the major design objectives of this unit was to develop a reliable automatic-receive system that would activate the printer if a signal was being received and would place the printer in "mark-hold" when the station quit sending. Most (if not all) such systems use a relay and sample the mark voltage through a long time constant. Since mark alternates with space under actual reception, this time constant must be made long enough to protect for fading signals; certain character combinations such as "blank" keys, etc.

Limiterless operation seemingly would prohibit the use of such a system unless the time constants were exceptionally long.

By utilizing our "minus-minus" system, it becomes a "carrier recognition" method—it operates equally well on limiterless or FM, although the sensitivity must be changed.

The "minus-minus" information is fed into a "squelch" tube, which in turn operates through one of the "or" gates to control the printer.

While true that any station near the mark or space channels will operate this unit, the sensitivity of the system can be adjusted somewhat to compensate. It is not, after all, a complicated autostart that can reject CW in favor of RTTY, but for this purpose it works most satisfactorily.

This is one of the greatest convenience features on the TT/L demodulator and involves no relays. The triggering action is such that only a 3 volt variation or less will change the state of the squelch tube. Since normal 850 shift provides about −55 to −60 volts at this point, this is indeed a very small variation and gives the system unusual flexibility when compared with other forms of mark-hold.

It might be mentioned that the operation of the auto-receive would not be satisfactory on narrow shift with the 850 cps discriminator—however, a simple add-on FM section with narrow shift discriminator would then give excellent auto-receive results.

41. The Power Supply

A heavy-duty 90 ma. transformer is used since there are more tubes than normal in this circuit. Both the negative and positive supplies are identical, and both are well-filtered and regulated. This contributes greatly to the stability of a high performance unit. The loop supply is independent and provides the unique plus-and-minus voltage to key the FSK system.

42. The Add-On Units

The possible filters that might be obtained or constructed vary so widely in type that we have suggested a possible circuit for moderately broad filters intended for use as a limiterless two-tone input section. A block-diagram is included for a typical heterodyne-mixing system in which very narrow filters can be used to copy a great variety of shifts. These diagrams possibly will give the reader ideas about other units which he might wish to add. These "add-on" units can be constructed externally for a few dollars each and hooked to the basic unit.

43. Tune-Up

With no signal input and the input grounded to keep the limiters "quiet", put a voltmeter to the input of the DTC/ATC (or to the cathode of V_{2b}. This voltmeter can be an ordinary inexpensive type as this is a low-impedance point not requiring a VTVM. Adjust R_{11} (cathode of V_{2a}) for zero volts with respect to ground.

Now with the standby switch in the "operate" position and with the auto-receive switch in the "off" position, rotate R_{27} (cathode of the slicer tube V_4) until the printer runs open; then back it off until the printer stops. Do this several times slowly and find the middle of these two conditions—set it there and let it alone. It should now stay at that setting. This of course could be checked from time-to-time, but should stay in adjustment, particularly if a high-quality, 2-watt moulded carbon pot is used.

If a limiterless unit has been added, the maximum voltage applied to the input of the DTC/ATC should not exceed about ± 60 volts DC with normal input. The receiver can be advanced until this situation exists, and the indicator system set accordingly. The FM system will probably give a little less voltage, as it is a "fixed gain" system.

The hardest part about constructing this, or any other home-made unit, is tuning the filters to proper mark and space frequencies. The easiest way to use an audio frequency counter, but it is not likely very many can do this! Willard Shears, W8HYE, has suggested that he will be willing to sell special audio tuning forks for this purpose at $10 a set. Sets are available for 2125/2975 or for 1275/2125. This is a very good way to accomplish the job.

After mark and space have been correctly tuned, adjust the filter balance control, R_{64} to give equal voltage swing for mark and space at the same point as was measured before—that is, the input to the DTC/ATC.

Now adjust the indicator balance control, R_9 to give equal closure of the eye tube for rapid reversals on mark and space. This is a simple adjustment and assures the eye tube faithfully following the detector output voltage.

None of these adjustments should need further attention for extended periods of time.

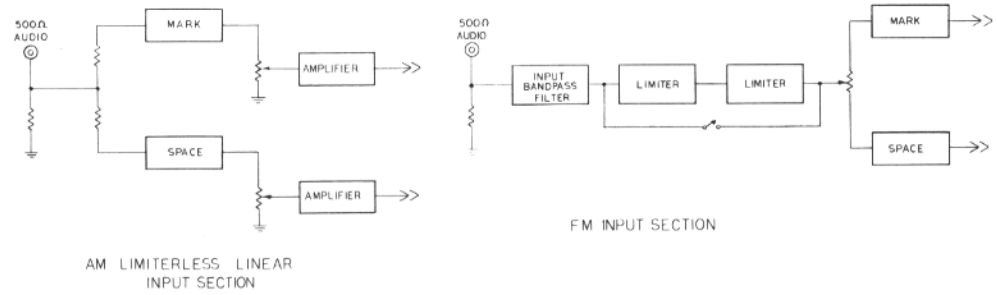
This completes the adjustments. The auto-receive pot is set so the printer will not run wild on noise. This might vary somewhat from day-to-day and from band-to-band. The indicator control will not need changing unless the shift being received is other than 850 cps.

44. Placement of Parts

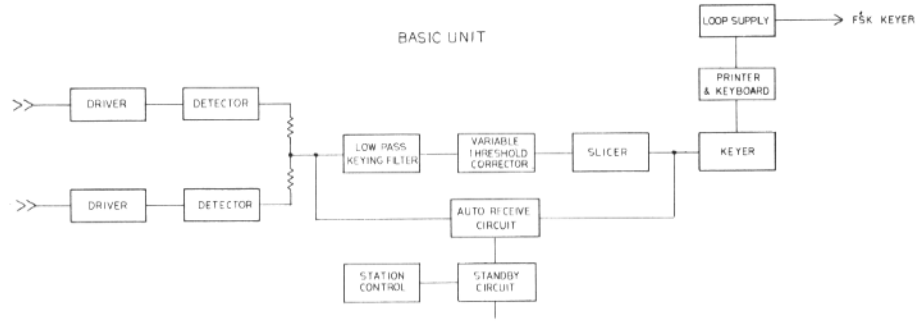
The auto-receive and indicator pots should be placed on the front panel. All other pots can go on the rear panel as they are set-and-forget controls. They need no knobs or dials.

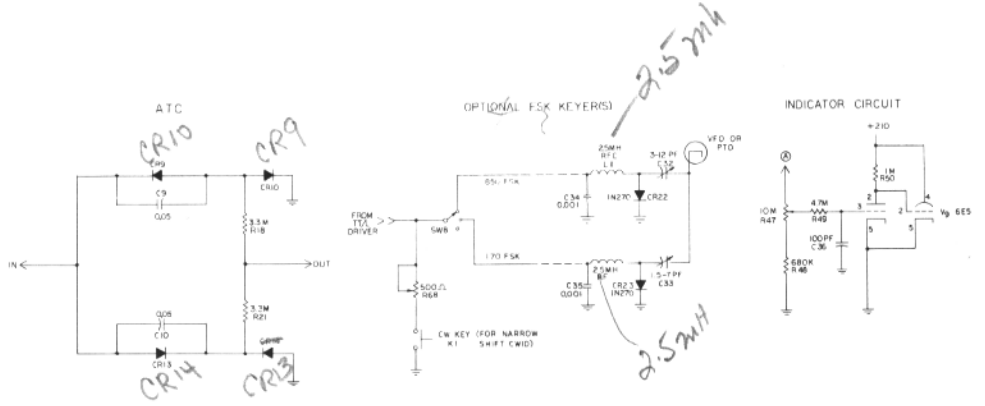
The switches would all go on the front panel. Several others not shown might come to mind, such as a selector switch for mark-only or space-only for the auxiliary add-on units, etc. Several of the switches easily could be combined on one rotary switch, also.

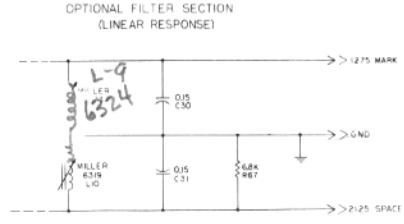
You might like to put the two neon lights connected with the auto-receive circuit on the front panel as well. These are N_2 and N_3. N_2 indicates when the unit is in standby

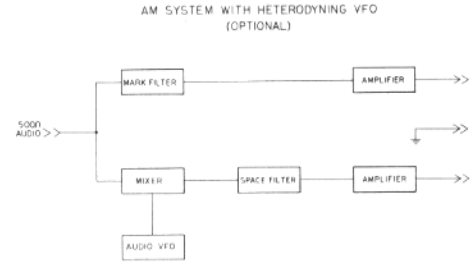


THE MAINLINE TT/L FSK DEMODULATOR

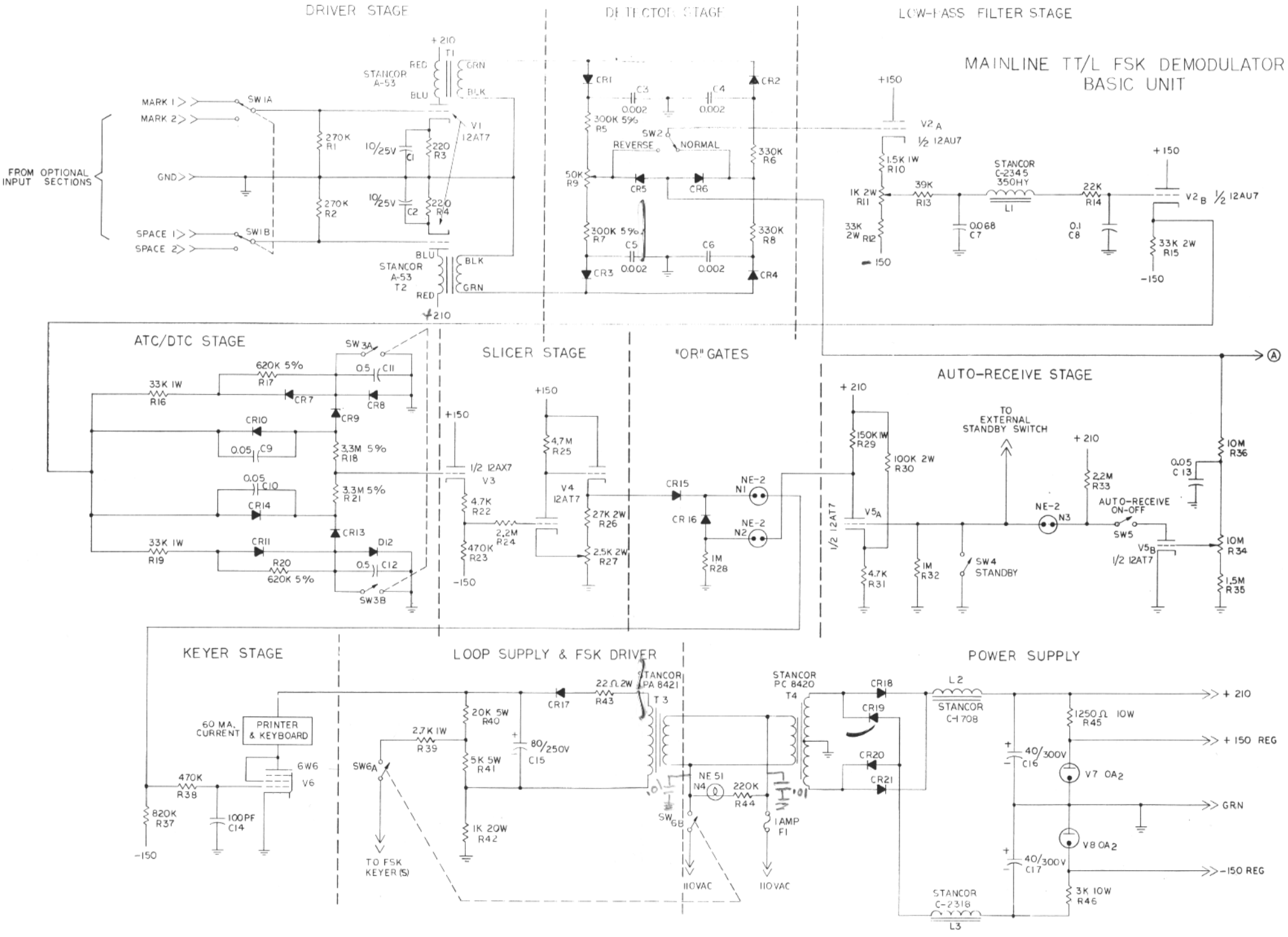


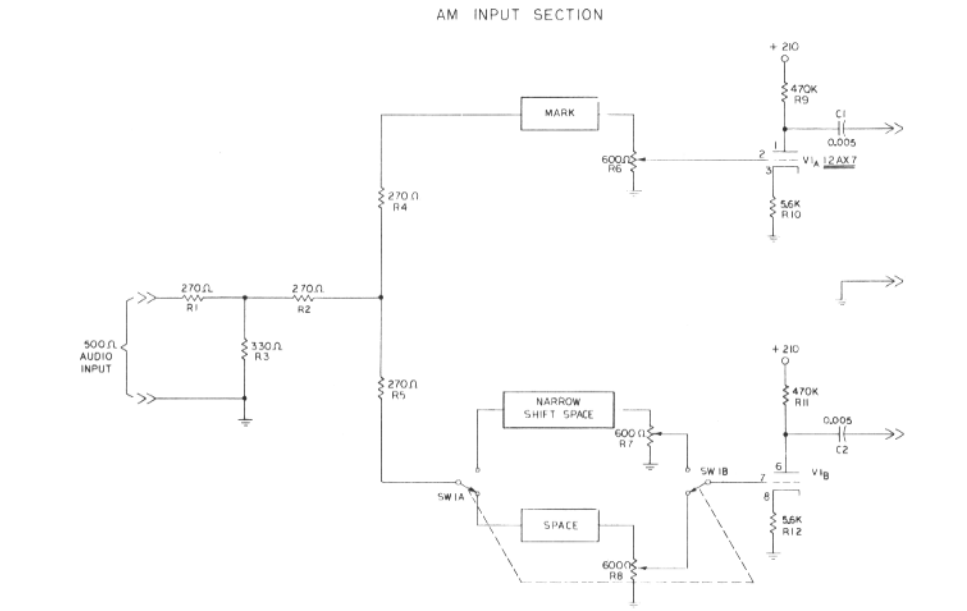


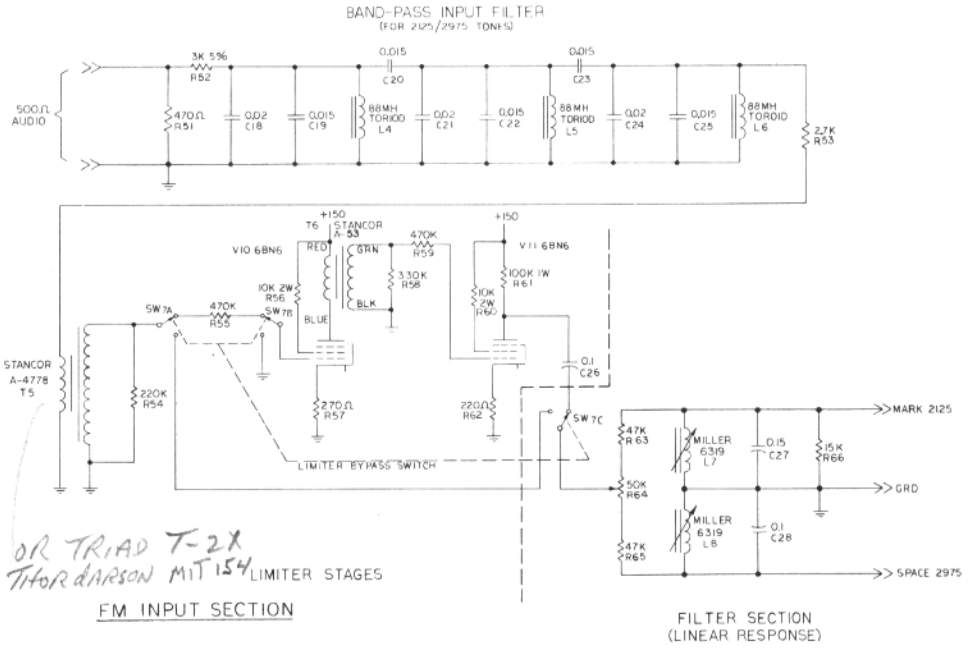




MAINLINE TT/L FSK DEMODULATOR BASIC UNIT







condition and could be a red neon. N_3 lights when the unit is in a receiving condition. They make excellent indicator control lights.

45. Narrow Shift Copy

Optimum signal-to-noise ratio on this converter is achieved only on 850 shift. If considerable work on narrow shift is desired, another discriminator could easily be constructed using higher "Q" filters. However, this unit will copy extremely narrow shifts, even so. Shifts as low as 4 cps have been successfully copied on this unit. Such shifts have no practical value to amateurs, but the example is included to show the tremendous flexibility of the TT/L. Shifts less than this could have been easily handled by the demodulator were it not for drift in the transmitting equipment. An auxiliary DC scope was used for tuning purposes, although the integral tuning indicator worked quite well to less than 27 cps shift.

46. Tuning and Drift Latitude

Due to the tremendous dynamic range of the TT/L demodulator, shifts can be accurately copied that have drifted to nearly 50 per cent of their shift—that is at least 400 cycles on a normal 850 cycle shift. The autoreceive would probably lock up the printer by that time, however. Excellent results can be obtained from round-table discussions, etc., while the operator is absent. In this respect, we feel this unit offers far better results from off-tuned stations while in "auto" position than any other type in use.

47. Distortion

With a minimum band-width post-detector low-pass filter followed by a threshold corrector, there is certain to be some distortion introduced. The system would not be working to optimum if there were no distortion. However this distortion is low enough (10-12 per cent) that the printer is not affected at normal settings and is not noticed except when making the distortion check. A no-distortion system would indicate time constants too long in the DTC; and a low-pass filter that was inadequate.

48. Summary of Features

1. Basic unit offering "add-on" units for FM or various types of two-tone inputs.
2. Optimum performance minimum band-width low-pass LC filter
3. DTC-ATC thresold corrector for optimum limiterless operation and improved limiter operation.
4. Stable trigger tube giving over 60 db. post-detector dynamic range.
5. FM limiter section giving full limiting to −56 db. input level.
6. Ability to copy shifts approaching zero.
7. Unique yet simple indicator system.
8. Auto-receive for unattended operation.
9. Circuits properly isolated with cathode follower sections.
10. Built-in FSK system not requiring the printer to be separated from the keyboard.
11. No need for polar relays or mercury-wetted relays.
12. Ability to place numerous machines in series for simultaneous copy without readjusting any controls.
13. Ability to automatically retransmit to another band.[22]
14. Data included for 1275/2125 filters as well as for 2125/2975 (although use of the lower tones is discouraged and thus no band-pass input filter was designed.)
15. Input band-pass filter for improved FM operation.

It should be noted that only half of V_3 was used. The other half will be available for any purpose desired, such as operating a relay to control the printer motor, etc.

49. Obtaining Parts

All parts, except the three 88-mh. toroids for the input filter of the FM section, are standard stock items of any major distributor. No critical, hard-to-get or discontinued items were used. All parts were purchased new and no junk-box compromises were included.

The diodes should all have extremely high reverse resistance except the ones used in the power supply, which are not critical. In the power supply we recommend the Sarkes-Tarzian F-8 type or equivalent 800 PIV diodes. In the loop supply D_{17} should be an F-6 or F-8. Elsewhere the F-4 is recommended, although many other types are suitable. Be certain they have a minimum of 200 meg. reverse resistance. The 1N2070 are suitable.

The capacitors should be Mylar types except those in the power supply (C_{14}, C_{15}, and C_{16}). Several good types are available—one suggestion is the Sprague "Orange Drop" Mylar types. In any event, they should have ± 10 per cent, or better, ratings.

Total cost for the parts should run under $107, including chassis and indicator.

50. Summary

After extensive experimentation and testing on various optimum units, both FM and limiterless, we feel that the FM system, when well designed, offers great potential for further development. It is not the complete answer, however, and for optimum results should be aided with an auxiliary limiterless two-tone input section featuring narrow filters. This combination should then handle all types of incoming signals as well as can be done with the present state of the art. It is assumed the FM section also could be operated as a limiterless two-tone system by bypassing the limiter.

continued . . .

THE MAINLINE TT/L FSK DEMODULATOR (Continued) . . .

Many tests can be made with this type of "add-on" unit, and it is hoped these comments and circuits will spur others to explore more fully the relative merits of these and other systems.

A transistorized demodulator with many similar features is on the way; and we have seen it in operation. It will cost substantially less to build and yet offer similar performance; having a total of 22 transistors. Present plans call for a printed-circuit board to be offered for simplicity of construction. It will appear in "QST" next summer.

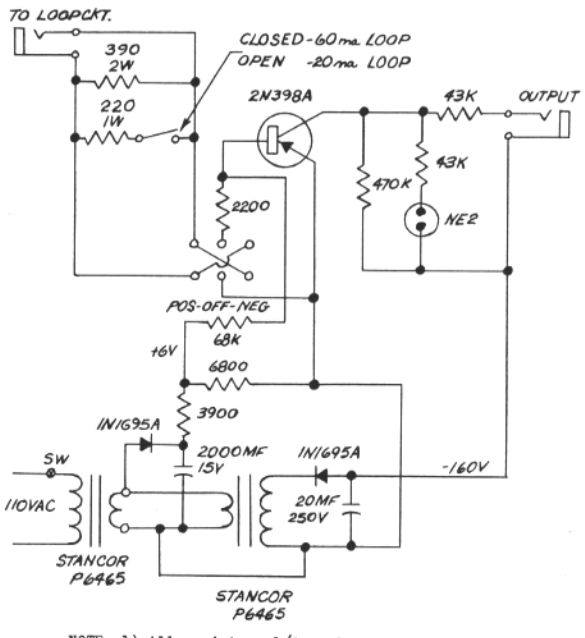
It has taken a great deal of personal time and financial investment to develop this demodulator. We feel that the interest already expressed has made the project worthwhile. We hope we have outlined the criteria for a good demodulator based on the best knowledge currently available to the authors. There has been no compromise with performance. Although the circuit offered is somewhat more complex than amateurs have used in the past, all controls are essentially "set and forget" type. The results, when compared with other units available for testing, both commercial and advanced amateur types, have been outstanding. The nearest equivalent commercial unit embodying comparable performance costs $1500 and higher.

51. Acknowledgements

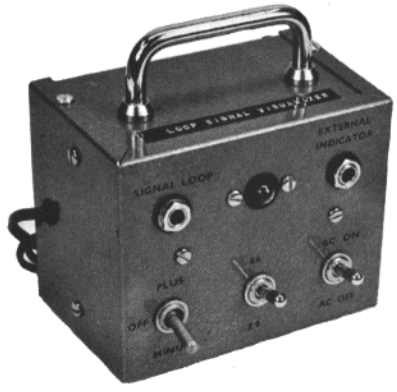
Our thanks go to all who have held continued interest in this project. To K6IBE for getting us into this development work and for his continued interest via telephone calls and personal visits when K8DKC was able to get to Huntsville occasionally; to W5HCS for stimulating suggestions; to W4MGT for forcing us to learn exactly what we were talking about; to K0DOM and W8UJB who "couldn't wait" to get started building similar units; to K8ERV for work on filters and other assistance; to W1FGL for sending us information on the Altronics-Howard Model "L" and other circuits; to Dick Hilferty of Press-Wireless for comments; to W6OWP for obtaining the Press-Wireless patent number that cleared up so many points of interest; and to all the others who have held interest in this work.

Particular attention is called to the many, many hours that K3NIO has devoted to assisting and guiding us in this work. Without his intelligent analysis of our data and consistent demand that we settle for nothing less than optimum, this project would have turned out much differently. He also ran a complete test of the demodulator in the Frederick Electronics laboratory to assure the desing goals were being met.

(Note: The references contained in this work will appear at the end of the technical discussion which follows in a subsequent issue.)



NOTE: 1) All resistors 1/2w unless otherwise noted.
2) No chassis grounds are used.
3) All jacks to be insulated from chassis.



THE LOOP SIGNAL VISUALIZER

E. H. Swanson, W2PEE

A recent piece of equipment picked up for W2PEE was a Model TS383 Distortion Test Set, usually called the DTS. The DTS is a rather rare device not often seen in amateur circles but really a marvelous help when it comes to adjusting teleprinters, keyboard contacts, and other teletype equipment. Basically, it consists of a signal generator which is operated by means of a motor driven set of cams and a signal viewer and analyzer. Various individual letter signals are selectable from the front panel. Also, a test message which is the usual "quick brown fox." The signal generator has the unique ability to generate a signal having any reasonable degree of bias up to about 50% (either mark or space) desired. In addition to the signal generator, the unit incorporates a signal viewer which takes the form of a whirling disc which makes one revolution per teletype character. Around the outside of the disc is a moveable bezel which is calibrated in the start pulse, the five signal pulses, and the stop pulse in the normal teletype code. A neon bulb affixed at the outer edge of the disc and viewed through a thin slit in the disc is lit on mark and off on space. Because of visual persistence this, then, will display the pulses of any repetitive character around the periphery, and by means of the calibrated bezel one can instantly measure the amount of distortion, either mark or space. The unit can be used to view the signal being generated by the internal signal generator or, by means of a cable and plug, can be keyed with an external voltage for viewing signals created by a teleprinter keyboard or a TD. This is easily done by putting the keyboard contacts in series with a voltage source of about 110 volts DC and connecting the neon circuit to this series combination. In this way keyboard bias or such problems as dirty or bouncing contacts become immediately evident.

Since I wish to use the device to measure my terminal units and also from a standpoint of checking other equipment in the system, I felt it would be desirable to be able to operate the neon from a standard DC loop of either 20 or 60 milliamperes. The gadget shown in the accompanying picture and schematic resulted. I suppose there is probably a name for such a device, but for lack of such knowledge it was called the "loop signal visualizer."

The visualizer is merely a switching transistor which is biased to cutoff in the absence of a signal and which conducts and turns on the neon in the presence of a signal which is the current in the DC loop. It is conveniently built into a small mini-box and utilizes a relatively low priced germanium transistor designed specifically for keying circuits. The input switch allows the keyer to be turned on and off and also to accommodate loops wherein the current may be flowing in either direction. The construction of the unit is entirely straightforward, two voltages being necessary for its operation; namely, +6 volts bias and −50 volts for the collector circuit. Two readily available 115 volt to 6.3 volt filament transformers were used back to back with the 6.3 volt winding being rectified and divided down to the 6 volt level and the 115 volt winding being rectified and filtered to give approximately 150 volts. By this means isolation from the power line is achieved and the required voltages are generated in small space.

A few notes of caution are in order: Both the signal input jack and the output jack to the neon circuit must be insulated from the chassis. The chassis is not used as ground and the entire circuit is floated. The 150 volt DC can appear between the input and output jack and if the unit is picked up while touching these two jacks a tingle can result. This could be avoided by inserting the output circuit jack in the return side of the 150 volt circuit. Also, when using the device with the DTS, care should be taken that the polarity of the output is proper for the DTS indicator. Otherwise the wrong electrode in the neon will light.

Other Uses

Since the front panel neon will follow the current pulses in any DC loop, it can be plugged into a loop to establish that the loop is keying properly. If the loop current does not fall to zero between pulses, the neon will not extinguish. Since the output is in the form of voltage pulses of approximately 115 volts, it may be connected directly to the oscilloscope and the scope may be used to view the pulse shape in the 60 ma. loop. If the scope sweep is adjusted to sweep once per character, it is possible, then, to make a repetitive character stand still on the scope. By this means bias can be detected and dirty contacts or bouncing contacts can be identified also.

Perhaps some clever fellow among us will come up with a simple mechanical whirligig wherein a signal viewer similar to that used in the DTS is made. All that is needed is a shaft which will turn once per teletype character and a disc with a neon coupled to a visualizer via slip rings. Thus one could view his own or any other signal in his DC

continued . . .

DX-RTTY

Edward Clammer, K3GIF
5940 Avon Drive
Bethesda 14, Maryland

The story of a DX RTTY Sweepstakes is almost always the story of Propagation conditions and this year as contrasted to last band conditions were considerably improved. In 1963 the fifteen meters band was a dead issue and the forty meter band was predominately a RTTY desert. But not this year.

Shortly after the start of the contest I happened to check 7040 Kcs and it was a madhouse. There was Bruno, I 1 RIF, Sergio, I 1 AHN, SM6CSC, G 3 HKR, DL 1VR all running S 9 or better. They must have caught the resident CW boys by surprise because they scattered them both high and low. It was a real pleasure to see that much maligned and hitherto unused segment of 40 meters come alive. They peaked up about 0230 GMT and by 0400 they were about washed up. Saturday night conditions must have regressed since only one or two of the above were heard and without much strength.

Saturday that good old fifteen meter band opened up with a bang and 5A3TX from Libya furnished a lot of inducement to those who were looking for that dandy African multiplier. A fair number of the active Europeans came thru and it began to sound like old times.

Back to 20 meters on Saturday afternoon there was Don, 5A5TR, from Libya and more Europeans than I have ever heard in a contest.

Saturday night on twenty meters was a reception of Friday night. No Asians, no Oceanians, no hope for the fifth and sixth multipliers.

Sunday the European DX began about dawn and lasted until about dusk. The most insistant of the Sunday DX signals on twenty was undoubtedly, Serge, I 1 AHN.

Without doubt the greatest attraction of the RTTY DX Contest is the great chance it offers us to meet old friends again. The English RTTYers were hard to find. Of course G3HKR was heard on forty but the only one I could find on twenty meters was that old timer, Bill Brennan, G3CQE, working I 1 AHN for his msg nr one. Its great to have Bill back on the bands again.

The main attraction to this DX Sweepstakes was the sustained activity on the part of the European hams. This resulted in continuous pile ups on twenty on both Saturday and Sunday. DX stations copied at K3GIF were:

SM6CSC, 40 and 20; LA6vc, 20; OZ7T, 20; GM3ENJ, 20; G3HKR, 40; G3CQE, 20; PAOFB, 15 and 20; DL 1VR; 15, 20 and 40; DL 3IR, 15 and 20; DL6 EQ, 20; DJ4 BF, 20; DL4 RM, 20; DL 1 IN, 20; F 8 KI, 20; I 1 RIF, 15, 20 and 40; I 1 AHN, 15, 20 and 40; I 1 LCF, 20; 5A3TX, 15—the only African station copied on 15; 5A5TR, 20—the only African station copied on 20; YV5AVW, 20—the only South American station copied; XE 1 YJ, 15 and 20; KH 6 AX, 20; FG 7 XT and KP 4 AXM, 15 and 20.

The most consisten station with the best overall signal on 40 was I 1RIF; on 20 was I 1 AHN and on 15 was DL 1 VR.

As might be expected with most of the DX activity centering on Europe the West Coast USA stations had a tough time beating out the East and midwesterners. Many, however, managed to get thru.

There were surely more DX stations heard and worked this year than ever before and for this reason we have to thank both the improved propagation and the fine spirit of the DX contestants.

BEFORE THE FEDERAL COMMUNICATIONS COMMISSION — PROPOSAL (Continued) . . .

APPENDIX

Proposed Amendment of Part 97, Amateur Radio Service Rules.

1. Section 97.9(d)(1) to read as follows:
§ 97.9 Eligibility for new operator license.
(d) * * *

(1) Whose actual residence and amateur station location are more than 175 miles airline distance from the nearest location at which examinations are held at intervals of not more than 6 months for General Class amateur operator licenses.

2. Section 97.27( ) to read as follows:
§ 97.27 Availability of Conditional Class examinations.

* * * * *

(a) If the applicant's actual residence and proposed amateur station location are more than 175 miles airline distance from the nearest location at which examinations are conducted by an authorized Commission employee or representative at intervals of not more than 6 months for amateur operator licenses.

HORSE TRADES

FOR SALE: 88 mhy Toroids, 50¢ each. 44 mhy Toroids 50¢ each, please add 35¢ for postage. WANTED: CKT diagram for CV-89A / URA-8A Frequency shift converter. W5EJV, 804 Shady Lane, Dallas, Texas 75208.

FOR SALE: CV-89 Audio Converter. Excellent performer, $175.00. Model 14 typing reperf with cover, without keyboard, also 14 TD, both for $65.00. TU and tape gear together, $240.00 F.O.B. KØDOM, 809 Carlos Drive, Lincoln, Nebraska.

FOR SALE: Local pick-up ONLY — model 15s and 19s write to Secretary, N C A R T S, 1004 Walnut Street, San Carlos California for details.

FOR SALE: Or Trade: Model 14 Simplex tape printer with keyboard, sync motor, end of line indicator, and covers. Make offer. Want Tape equipment. W6KAR, 1467 Cachuma Ave., Ventura, Calif.

FOR SALE: Or Trade: New and used 4CX250b's, trade for new and used 4-400A's. Or sell new 4CX250B's for $25.00 each. Looking for 75A-4 and Drake TR3. WØHLS, 1722 South Corona, Colorado Springs, Colorado.

FOR SALE: Clearing out sale AN/FGC-1 Radioteletype Converters $50.00 Used. New with spare parts $125.00. ALA-2 Panadapters with free conversion instructions $29.95. 19"x72" Open racks and enclosed racks, new and used, as low as $12.50. Write for free list. GULF ELECTRO SALES, Inc., 7031 Burkett, Houston, Texas 77021.

WANTED: Model 28 with sync motor. Must be complete. Send price and description in first letter. K3AUD, Box 524, Republic, Pa.

WANTED: Converter, must be less than $75.00 and complete and operative. Have a model 26 to be operated from it. Send details, as to price and condition. Martin Bleiweiss, 381 North Forest Ave., Rockville Centre, N. Y. 11570.

FOR SALE: Model 14AP recvg. typing reperf., 60 wpm, sync. base and cover holding mags, excellent, waiver, $35.00 F.O.B. K8DDC, P. O. Box 251, Chillicothe, Ohio.

FOR SALE: Model 14 typing reperf with keyboard, $75.00. Model 15 printer with keyboard and table $100.00. All in excellent condition. No waivers. W6VYI, 2647 20th Avenue, San Francisco 16, California.

WANTED: All 1963, 1962 back issues of RTTY. Weather type box for model 28. FOR SALE: Boehme 4-D; 3-E drive and head for C.W. tapes .Wheatstone perforator. K2MVR, 33 Laurel Place, Upper Montclair, N.J. 07043.

FOR SALE: 15 page printers. Intermediate gear and bracket for attaching model 14 reperf to keyboard base. FRXD. New 15 keyboards. Covers for 14 reperfs. W9YVP, 11001 South Pulaski, Chicago, Illinois 60655.

FOR SALE: Model 15s, 19s send SASE for list. WA9HDG, Orchard Hill Farm, Tinley Park, Illinois.

FOR SALE: Model 15s, 14 and Teletype parts. SASE, W6VPC, 1067 Mandana Blvd., Oakland 10, California.

REPAIRS: Teletype repair tech with 14 years of experience. Service and parts. Robert Tetrault, 17 Dick Street, Clifton, New Jersey 07011.

W6AEE DE WØJRQ

Popular F.C.C. 15th regional engineer in charge dies suddenly at Denver . . .

Andrew H. Bahlay, KØOOA, 47, died suddenly of a massive cerebral hemmorhage on the morning of September 16. Andy, an active ham for many years and a native of Brooklyn leaves his wife Helen and two daughters.

He had been with F.C.C. for 20 years, six of them were spent in Denver coming here from Washington, D.C.

Andy was very popular with all amateurs as well as those in the broadcast industry throughout his region and will be sorely missed by all . . .

THE LOOP SIGNAL VISUALIZER (Continued) . . .

loop quite readily. Another use would be to take the output signal from the visualizer, run it into a zener regulating circuit and a potentiometer and thus a keying signal for keying an FSK diode or varicap would result. In so doing the visualizer could eliminate the need for a polar relay and allow the keyboard and printer to be connected in series, thus providing the simplest possible circuit for local copy.

Perhaps there are other uses which some of the boys can dream up. I have found it useful in checking the local loop circuits around the shack. In any event, it's fun to watch the light blink when plugged into your DC loop. It will make your station much more interesting to the casual visitor.

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