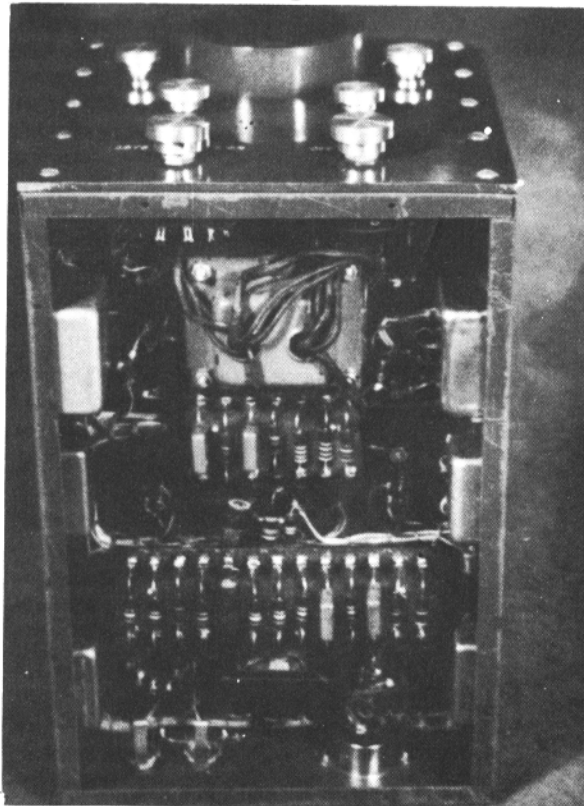


Terminal Unit Showing Placement of Parts



Under Side of Chassis

## This is a Terminal Unit - 'I Am a Ham'

By William M. Gates, Engineer Division, Don Lee Broadcasting System

It was 3:04 on the day watch, August 15. I was assigned to maintenance. A terminal unit was to be built, the filters were not made, my job—WIND EM.

3:06. My partner Bud and I took our feet down from the desk and strode across the room to the wire rack, that's right. Someone had made off with the gage 26. This is a definite 304 and maybe a GTW (Grand theft wire). There was almost a thousand feet, some one had to have it. There are all kinds of people in a city,—some we'd rather not know. Some are wire thieves.

3:30. After having a stiff coke my partner Bud and I saw the chief, Thad Arne. Where's the mama sheet on all the known wire thieves with an 802 M.O. Get out an APB on all the known wire thieves, while I get the hot-shot.

Just got a rumble on the hot-shot, Bud, found the guy responsible for this job. There's nothing the force hates like a bad cop, Mister. And this one's very bad. Now for the clue, Bud. All you got to do is find the "copper".

Tum de Dum Dum.

\*"With apologies to Dragnet".

The first consideration in the construction of a terminal unit is usually the problem of selecting the type of filters to be used, for it is the filters that truly determine the excellence of a good terminal unit trick circuitry can not make a terminal unit operate properly if the filters are of poor design.

Some of the requirements of a good filter are these:

- 1—The filter should have a low insertion loss.
- 2—The characteristic impedance should be low so that there are no high impedance circuits which are prone to cross-talk or common coupling.

- 3—The impedance should also match the output impedance of the receiver so that an auto-start system can be used without the terminal unit having to be turned on continuously,
- 4—The band-pass portion of the response curve should be flat to allow a certain amount of receiver mistuning or drift to be present without incurring loss.
- 5—The skirts of the response curve should be steep to discriminate against unwanted signals and noise.
- 6—The filters should be stable and should have the same rejection at any signal input. (This rules out regenerative type circuits).
- 7—The filters should be accurately adjusted to frequency and should not drift due to warm-up or other circuitry changes such as tube replacement.

In view of these requirements the only filter that was found to pass on all counts was the "m Derived" band-pass type. These filters consist of three high Q powdered iron core toroids, each being tuned by appropriate capacitors. The terminal unit shown in the diagram has been built around band-pass filters having 600 ohms impedance, with a band pass of plus or minus 100 cycles. It will be noticed that both filters are paralleled on the output of a receiver which has an output impedance of 600 ohms. This is entirely permissible for it will be remembered that only one tone is present at any instant and therefore the filter that is not being used at any particular instant has high impedance and is not loading the circuit.

No amplifying tubes are used ahead of the filters because as was stated under requirement (3), it was desirable to have an auto-start system that could be used without the power being applied to the terminal unit under stand by conditions. Assuming a receiver output of one watt

would indicate a voltage of 24.5 volts applied to the input of the filters. The filters have about two db loss thus giving 19.5 volts across the 600 ohm terminating resistor can be rectified as shown by germanium crystal and made to operate a sensitive relay to apply power to the terminal unit and the printer simultaneously. The filter condenser should be of sufficient size to remain charged for a reasonable length of time after the 2125c tone is removed. Each half of a 6SL7 is used as an amplifier after the filters to obtain sufficient voltage to deflect the spot on the indicating scope tube. This voltage is then fed through the usual switching system to the detectors which in this case were 6SL7's again strapped as diodes to keep the number of tube types at a minimum. The detected voltage appears across the diode output load resistors and these voltages are combined by the 500K combining network. At this point the rectified signal is R-C coupled to the clipper stage which follows. Most circuits are direct coupled at this point, which means that the tube must be biased midway between cut-off and saturation, consequently each signal alone (as during a deep fade) could only utilize half of the grid swing of the clipper tube. By the use of R-C coupling a full grid swing can be realized with either the 2125 or 2975 signal alone. Unfortunately when R-C coupling is used on a steady signal (such as between words) the coupling condenser becomes discharged and the noise present will be amplified and will cut off the keyer tube and cause the printer to "clunk." This made it necessary to couple enough voltage from the 2125 detector output to the clipper tube to cut off the tube when a steady tone was being sent. The 3.3 meg resistor is used for this purpose. Under keying conditions this resistor is so large that it does not effect the signal on the clipper tube.

The clipper tube is also half of another 6SL7 which is biased midway between cut off and saturation and is overdriven by the signal so that the noise

which is present on top of the detected signals is removed when the tube goes into cut-off or saturation. The 6SL7 will cut off much better if the bias is held constant instead of using conventional cathode biasing. The 82 K ohm resistor to plate supply accomplishes this satisfactorily.

The clipper tube is R-C coupled to the keyer tube which is clamped or DC restored, whichever you prefer, by means of the other half of the clipper tube which is connected as a diode, as shown. This clamper assures that all signals arriving at the grid of the keyer tube are going in the negative direction and will therefore cut off the keyer tube as required. The keyer tube in this case is a 6K6 (a 6V6 will do as well). Our model 26 will operate satisfactorily with a battery furnishing 10 mills when the magnet coils are connected in series. A 6K6 with the printer coil in the cathode was found to draw 25 mills with 105 volts on the plate when connected as a triode. The 105 volts was obtained by means of an OB2 tube connected from plate to ground as shown with a 10K ohm 10 watt resistor to the plate supply. When the 6K6 is conducting, 25 mills flows through the keyer tube, and 5 mills through the VR tube. When the keyer tube is cut off by a signal, current that previously followed through it now flows through the VR tube because the voltage on the plate tries to increase, making the VR tube conduct more heavily. This action makes for a steadier load on the power supply, thus keeping all other voltages more constant, and also it furnishes a constant voltage on the plate of the keyer, thus making it easier to drive to cut-off. There is no reason for using a tube larger than is needed for pulling up the relay in the printer. A larger tube is only more difficult to cut off with the signal. The 2500 ohm resistor across the printer coil is to reduce the inductive kick when the keyer tube cuts off. The power supply for

(Diagram on Pages 6 and 7)

(Continued on Page 8)

## NEW RTTY GEAR



The 51 type Frequency Shift Exciter was developed to adapt new or existing high frequency transmitters to frequency shift operation in conjunction with Teletype or other printing equipment. At moderate cost present radio transmitters can be converted simply and quickly to this more modern mode of transmission.

### PERFORMANCE CHARACTERISTICS

Type of output—Frequency Shift or C. W.  
 Number of RF channels—4 pretuned each selected by switch.  
 Additional operating frequencies available by substitution of crystals and retuning; all adjustments from front of panel.  
 Output Frequency range—2 to 9 megacycles  
 Crystal Frequency range—2 to 4.5 megacycles  
 Nominal output voltages—  
 1. High impedance (100000 ohm load 100 volts r.m.s.)  
 2. Low impedance (72 ohm load 5 volts r.m.s.)

### KEYING SOURCES

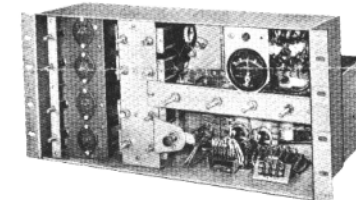
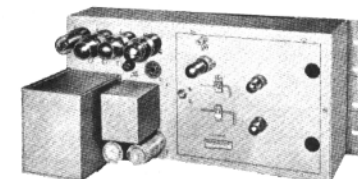
Frequency Shift  
 Local transmitter-distributor or printer keyboard, electronic operation, on a neutral basis.  
 Remote transmitter-distributor or printer keyboard, polar relay operation, on either a neutral or polar basis.

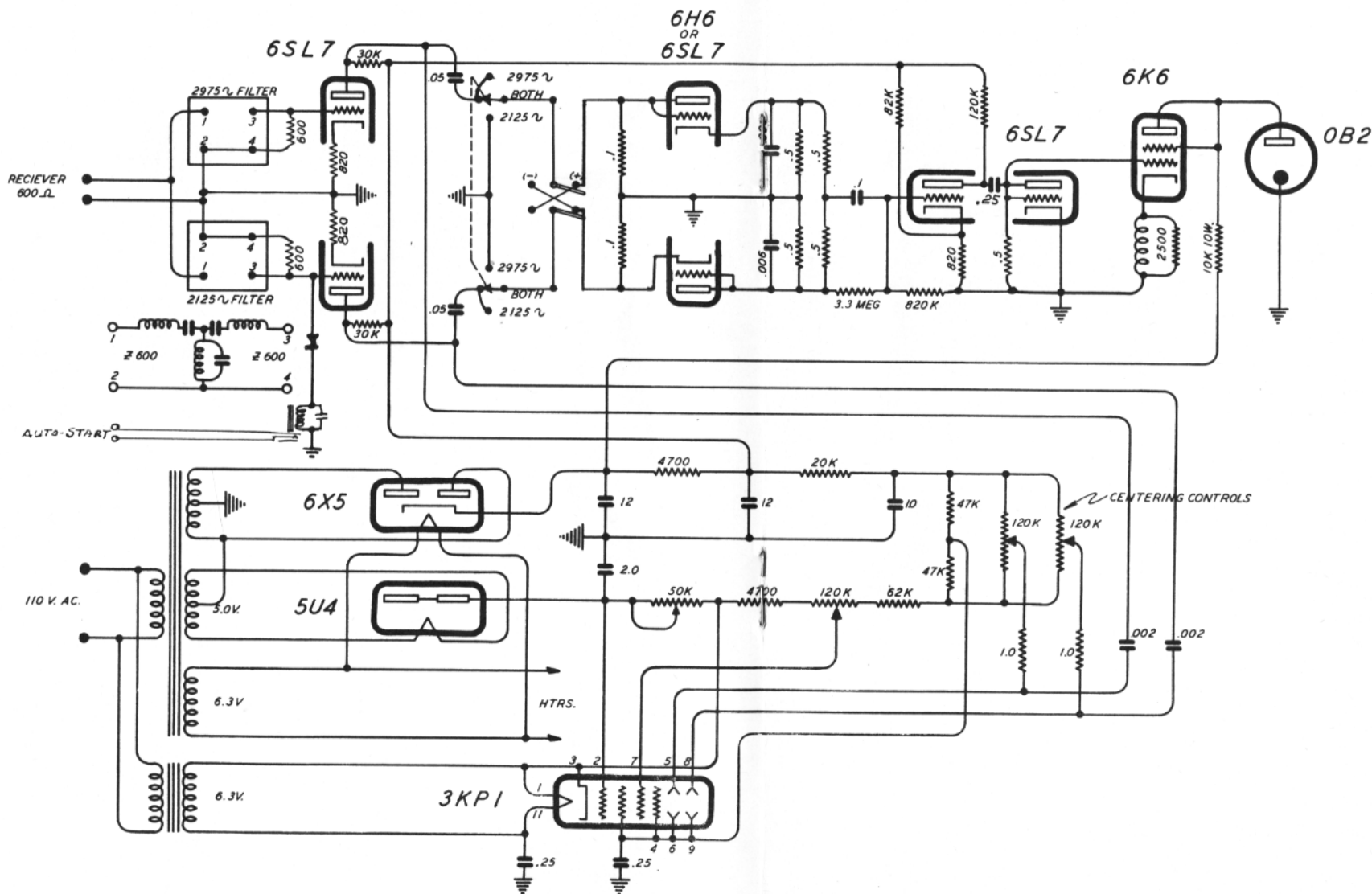
### Frequency Shift Limits

1. 2—2.25 mc
2. 2.25—2.5 mc
3. 2.5—3.0 mc
4. 3.0—3.5 mc
5. 3.5—4.5 mc
6. 4.5—9.0 mc

### Adjustable Limits

- 20 to 500 cycles
- 20 to 850 cycles
- 50 to 1200 cycles
- 75 to 1500 cycles
- 100 to 2000 cycles
- Double above limits, depending upon crystal frequency.





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pp 265-267, "A Narrow-Band Frequency Shift Telegraph System", R. Terlecki

Bruce Meyer W0HZR

RTTY would like to receive lists of stations copied from those who are equipped for receiving only at this time. Or from those who are transmitting on two meters only. This type of column was quite popular in the earlier days of amateur radio and should prove to be of interest to many stations. It will provide a better idea of the coverage of our various frequencies as well as coverage from the different areas.

\*\*\*\*

FLASH: Coming in the November issue, an I. F. Converter for RTTY signals.

### "THIS IS A TERMINAL UNIT"

(Continued from Page 4)

the terminal unit and indicator scope is conventional.

This terminal unit gives a very clean cross on the indicator when properly tuned to a teletype signal whose shift is the standard 850 cycles. Any deviation from the standard is at once apparent, due to the accuracy with which the filters tuned, a crystal controlled oscillator being used in a step-down circuit to arrive at a highly stable calibrating frequency standard. By careful tuning it is possible to copy either side of a multiplex carrier, which is some indication of this converter's ability to discriminate against nearby unwanted signals. On many occasions this terminal unit has made perfect copy on signals that were fading so deeply that there was no evidence of a carrier in the phones. Several terminal units have been built using this circuit; one was built by description on phone and in a matter of hours was built and working perfectly. All of these units have given good service and have surpassed all expectations



"Just a note to let you know the model 26 arrived yesterday in excellent condition. Haven't gotten it on the air yet, but will have it soon. It is a pleasure to work with nice equipment. One thing though, how do I remove easily the "unshift on space" feature? I've looked all over for some reasonable cam or lock-out device and cannot find any. The 26 is made, isn't it to be either way?"

(A few of the 26's did have a means of providing this feature, however, the later ones did not have it. So it can be either, unshift on space or not. The fourth star cam on the shaft under the type wheel is the one which has to be interchanged to cut this operation out. Ed.)

"Guess you have heard by now that I received a citation from FCC several weeks ago for talking too long and not shifting wide enough. The shift was only 727 cycles. Right now I am gathering up parts for the audio deviation meter described in February RTTY for obvious reasons. Hi Hi. So you might warn the brethren of the fact that the FCC takes a very dim view of improper shift and talking too long. Nothing else new here in the way of activity except for the above mentioned encounter with the FCC at Santa Ana. Pretty green ticket too. First time I ever got one for anything and for something that I should have checked more often than I do."

—73 Don W7KWB

RYRYRYRYRY

"You may be interested to know that the modification of my Bendix TA-12-C for FSK operation on the 40 and 80 meter bands is now complete. Right-Side-Up keying is obtained directly from the sending contacts of the keyboard. The cir-

cuit is similar to those in general use except that a variable (slug) inductance is substituted for the more usual variable capacitor for the element causing the desired frequency shift. Keying control is the usual diodes to ground (1N34) back to back with the sending contacts connected thru a suitable radio frequency filter in series with one of the diodes to ground. The use of an inductance instead of a capacitor accounts for the Right-Side-Up keying. The inductance were adjusted by cut and try until the desired shift was obtained with the tuning slug about half way into the coil. A 50,000 ohm pot was connected across the sending keyboard contact to give a "Fine Control" of the amount of frequency shift. This control may be placed within convenient reach of the operator. As a suggestion, slug tuned coils designed to tune the broadcast band are too large, and are easily adjusted to the correct value by unwinding turns during test to adjust the coils to correct size. Up-Side-Down frequency shift is evidence of too large a coil."

—73 Ted, W6CMQ

RYRYRYRYRYRY

"Have a few ideas you might discuss with the gang at the ham fest. First one is to obtain RTTY privileges on 160. You see, the only place FCC gave us privileges was on those bands where cw only was permitted. Since on 160 there are no such portions of the band we were not given permission to use 160. I think we should move in on this since 160 will be fine for at least three years and the sun spot cycle goes down hill for another year. Even goes to pot on 200 mile haul in late evening. I would like to use a lower frequency band. I

gave up on two meters, too many lousy TV sets with no shielding in the audio and my 500 watts plows into the audio end of the TV sets as far away as two blocks."

—Frank W3PYW

RYYRYRYRY

"Just got a copy of "RTTY" and noticed a red arrow on the front part pointing to the May '54 on the address. If this means the subscription has expired, advise how much and a check will be on its way."

(Yes—this is one way in which we can notify our subscribers as to the expiration as RTTY operates on a very limited budget, and trust it will be clear as what the date on the right side of the address means. Ed.)

RYYRYRYRY

"Guess you thought I'd gotten wound up in the 26 or caught on one of those wicked carriage returns it has, but such is not the case. The fact is that I have been joining the great ranks of the "Do-It-Yourself" boys known as handy-men in the old days. Actually what I did was to add a room on the back of the house to house yours truly and all the associated junk and on a concrete block house that is no picnic. All I have left to do now is to put in some shelves and move in the rig and it will be finished. The XYL has decided that I am now an expert and she has been dreaming up all sorts of projects for the ole construction department. Some fun. She didn't think much of it when I told her the next thing on the agenda was a TVI proof rig for 80, 40 and 20."

—Doug, W4TJU

RYYRYRYRY

"I am not afraid now to go into RTTY as John, W5MYI and I will be able to swap ideas. John told me that he is using the converter that you designed and that it is working ok. I haven't started building one yet but have been accumulating ideas from the type of equipment they are using in the Navy."

—George Sale, W5YLN

## NET ACTIVITIES

### RTTY SOCIETY OF S. C. NET NEWS

The RTTY Society of Southern California Net operates every Tuesday evening at 8:00 p.m. on 147.85 mc.

#### Activity for the Month of September:—

Sept. 7—W6EV, N. C.—16 Checkins

W6's AEE, SCK, CG, DNJ, FLW, SCQ, EGZ, IRF, IIV, IZJ, NAT, RCM, ZBV, IRF, IAL, and EV.

Sept. 14—W6IZJ, N. C.—20 Checkins

W6's AEE, BWQ, CG, CLW, CYR, DNJ, EGZ, EV, FLW, IAL, IRF, JAU, NAT, RCM, SCK, SCQ, IEU, ICS, IIV, ZBV.

Sept. 21—W6IIV, N. C.—21 Checkins

W6's IEU, PNW, AEE, BWQ, SG, CLW, CYR, DNJ, EGZ, EV, NAT, RCM, SCK, SCQ, ZBV, FLW, IAL, IRF, JAU, ICS, IIV.

Sept. 29—W6NAT, N. C.—29 Checkins

W6's AEE, BWQ, CAP, CG, CGN, CKS, CLW, DNJ, DEO, EGZ, EV, FXF, FLW, IAL, IEU, IIV, IRF, IZJ, NSS, NWM, RCM, SCK, SCQ, WYH, NAT, LBV, ZBM.

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For Information Regarding the  
Society Contact the Following:

W6CLW—Ed Simmons  
W6AEE—Merrill Swan  
W6SCQ—Lewis Rogerson

For Traffic Net Information:

W6FLW                      W6IZJ

For "RTTY" Information:

W6CL      W6DEO      W6AEE



I guess that is about mid-way between. W2BDI was in town. Called on phone. Had some minor troubles about FSK of his OSC but has been on. Ed W2BDI (same letters in call Hi!) worked Ed Handy, W1BDI on net on Wednesdays as soon as he found his last bug. Says his 26 is printing OK.

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... W8BP de W8BYB, Detroit. OK Walt—ring that bell! I was away from the TTY and had to dash to it when you stood by. Now will have to read copy. QRX

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... W6ZBV de W6NWM, fine Cec. Well that is about what I have planned. With an 813 in the final. Should be able to do about 500 Watts on CW or FSK, with a good blower! And as long as I have the larger transformer, I think it will be good insurance in case I want to use the 813 as a buffer stage some day! OK on getting upstairs. Well, before you go make me an offer on that 21A! I want to get rid of it. What have you got that is a white elephant to you? So will let you go, Cec. Thanks for the fine contact and I will see you later. AR

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... W6AOE de W6EV, OK. Well when you came on you were three quarters of an S unit higher. And I didn't shut the receiver down at all. Don't get it. Now if you were off for a longer period you would go right up to where you were before, I think. Sounds that way to me. Well what say W6AOE de W6EV. GA. W6AOE de W6EV. Roger, that is correct. The B plus was off and it is this receiver. So 73 and 88S to Eleanor and Cul de W6EV LA. Clear.

\*\*\*\*

... W1BGW de W3MHD, Broughton, Penna. Fine Jack and thanks for the reply. You are land-line in here at the present time. Very fine. Heard you calling KFEF a while ago and you weren't as strong then as you are now. He had a sig about the same as yours here. I

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... W6OCL de W6PFF at Rosemead, California. Good evening to you Bart and glad to work you on RTTY. Just thought I would get on for a very short hello as I am wanted in the house.

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... W6CG, W5HZF, W6AEE de W6UPY Rolling Hills. Roger, all. Marvin I think I will run your xmission back to you to let your friend see how you are coming in out here so here goes your tape.

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... W0UVL de W6WOC. OK Trot on most. I sure wish I could eliminate fading some easy way. Then things would be peachy. Hi. Here is some automatic slip that describes where El Cerrito is.