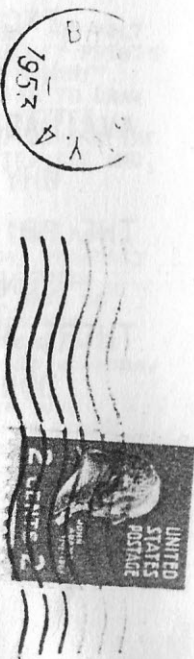


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Amateur Radio Teletype Society



JULY 1953

There have been so many wonderful letters of compliment about the #24 Bulletin that I could just about fill up 32 more pages with testimonials. Thanks. Only one complaint this time about the non-teletype material, and a whole raft of further urging.

The June issue of the Reader's Digest (page 25) had a fine article, "What is the Limit of Your Mind?" which says much of interest to those of you who have not particularly studied the mind and its possibilities. After reading this you may begin to get interested in doing research yourself on the subject and in keeping up with what is going on in that field. Even small successes in this field could have world-wide effect. Writes W4ZC/2, "Have been a worker in the fields of psychology and psychiatry for more than 20 years and that is one of the reasons that I have so little time to play with this darn RTTY. Average about 20 hours a week here in Newark at two different childrens clinics. I enjoy the work and feel that occasionally we manage a minor miracle.

Being July; being HOT; being QRN'y; being vacation time; being lousy RTTY. Many reports of fishing, building, loafing; few reports of activity. But that is as one might be expecting, eh? The main thing is not to let things go too long so that you will be right where you are now come Fall and we again flourish on the bands. Now is the time to get busy and build the converter, get your tape gear, etc.

As promised, the big news this month is the circuit of the Northern Radio converter. True, this unit uses eight tubes, but if you will look carefully at the diagram you will note that the circuits are almost all just resistor-condenser circuits, and that the only filter system is in the first stage. The probability is strong that this circuit will soon be the "standard." We'll know more about that when a few fellows have built them up and tried them.

Bulletin No. 25

Toward the end of May my partner, John Karlson, and I got in John's station wagon and headed for the RMA Parts Show in Chicago. Out near Lima, Ohio the car hit a wet curve and skidded into a ditch, turning completely over in the process. Neither of us were hurt, fortunately, but the car was in bad shape.

After having the car towed to a nearby garage we caught a train for Chicago and left everything but some clothes and all the catalog sheets we could carry. Our trip turned out to be very successful though since I had shipped one of our Karlson enclosures by truck for use in the Bell Sound System exhibit. The exhibit had the Electro-Voice Patrician enclosure in one corner (\$727), the Jensen Tri-Plex (\$300) in the other, and in the worst part of the room: the Karlson. Even so, the contrast was so great that we were able to let some of the top salesmen in the country come in and hear it and sign them up. We now have manufacturer's representatives in almost every section of the country. Most of our reps also sell Bell amplifiers and Astatic cartridges, both being the top selling item in their category.

Since returning home I have been busy supplying our reps with all the literature and sales ammunition I could turn out. Now, with national distribution of the product by such an outstanding group of reps; with our factory turning out enclosures in ever increasing numbers to keep up with the demand, with a consumers "Tested in the Home" report in the next issue of High Fidelity magazine (and an ad in the same issue), with most of the mail order radio houses putting the Karlson in their catalog, and with a good promotion and advertising campaign all set for fall (including a feature article in Radio and Television News) we are getting in a very good position to take advantage of the expanding high fidelity market. Life, in the Coronation issue, estimated that the sales of high fidelity equipment for 1953 would be between 60 and 100 million dollars. This means a minimum of \$6,000,000 for enclosures. Since we have an attractive unit which will outperform anything else available we should, if we do any job at all on advertising, be able to get a good slice of that market.

With the present tax setup it is impossible to expand a business out of earnings, therefore we must raise additional working capital from those interested in investing. Within the next few weeks we should be incorporated and be able to sell stock in the venture. Quite a few people have asked about this personally and in letters. As far as I know it will not be possible to make any direct offer of stock except to those that write in and ask about it. The next issue of the Bulletin should have more details.

At any rate, the prospects for the corporation are very good. If we can't make money with a deal like this, then what can you be sure of? The product is the best on the market, the price right, the market is a multimillion dollar one and rapidly expanding, the salesmen are the best in the field, the manufacturing is all subcontracted to a factory that can handle almost any quantity that could be needed. Everything seems to be in our favor. I'll write up a comprehensive prospectus which will be available in a couple weeks to anyone interested. I'd like to have as many of the RTTY gang as possible to get a piece of this because I think it is going to go along way.

ON WIRE LINES PRINTING TELEGRAPH EQUIPMENT FUNCTIONS IN TWO MAJOR CATEGORIES:- POLAR OR NEUTRAL LINES.

POLAR LINES ARE USED FOR PRACTICALLY ALL LONG-HAUL COMMUNICATIONS AND, CONSIST OF SENDING "BATTERY" OF ONE POLARITY OVER THE LINE FOR "MARKING" SIGNALS (CONTACTS CLOSED AT SENDING APPARATUS) AND BATTERY OF OPPOSITE POLARITY FOR "SPACING" SIGNALS (CONTACTS OPEN AT SENDING APPARATUS). LINE CURRENT IS GENERALLY SET AT 20 M.A.

NEUTRAL OPERATION (ALSO KNOWN AS "MAKE-BREAK" OPERATION) SENDS 60 MIL CURRENT FOR MARKING SIGNALS AND NO CURRENT FOR SPACING SIGNALS. IN RADIO-AMATEUR LANGUAGE "MAKE-BREAK" OPERATION CORRESPONDS TO "C.W.".

ALL PRINTERS FUNDAMENTALLY ARE NEUTRAL TYPES OF APPARATUS AND MOST SHORT-HAUL CIRCUITS MERELY CONNECT ALL STATIONS IN SERIES WITH THE SINGLE-WIRE LINE, WITH THE FIRST AND LAST STATIONS RETURNING TO GROUND TO COMPLETE THE CIRCUIT. ANYPLACE ALONG THIS SERIES LINE A BATTERY OR GENERATOR WITH ITS CURRENT-LIMITING RESISTOR CAN BE CONNECTED. OCCASIONALLY A BATTERY WILL BE CONNECTED ON EACH END OF THE LINE (AIDING). LIKE MORSE TELEGRAPH KEYS TELEPRINTERS KEEP THEIR SENDING CONTACTS CLOSED WHEN NOT SENDING. THIS PRESERVES THE SERIES CIRCUIT.

LARGE TELEGRAPH AGENCIES, IN SENDING BETWEEN WIDELY-SEPARATED CITIES, OPERATE THE INTER-CITY LINES POLAR BUT RUN NEUTRAL "LEG" CIRCUITS FROM THE MAIN OFFICES IN EACH TERMINAL CITY TO THE LOCAL OFFICE FROM WHICH THE MESSAGES ORIGINATE. THIS KEEPS THE BALANCING AND ADJUSTMENT OF POLAR AND DUPLEX EQUIPMENT UNDER THE SUPERVISION OF SKILLED MAINTENANCE MEN. THE LOCAL OFFICE KEYS A NEUTRAL "TRANSMITTING" RELAY AT THE MAIN OFFICE; THE CONTACTS OF THIS RELAY CONNECT THE INTER-CITY WIRE TO THE POSITIVE AND NEGATIVE "BATTERY" TERMINALS THUS SENDING POLAR SIGNALS OVER THE LONG-DISTANCE CIRCUIT.

INCOMING SIGNALS (POLAR) KEY A POLAR RELAY, THE CONTACTS OF WHICH MAKE-AND-BREAK THE NEUTRAL "LEG" CIRCUIT. ARRANGEMENTS ARE MADE SO THAT SENDING AND RECEIVING CAN BE ACCOMPLISHED OVER SAME WIRE IF DESIRED.

BECAUSE OF THE HIGH KEYING SPEEDS WITH LOW DISTORTION POSSIBLE WITH POLAR RELAYS THEY ARE ALSO USED FOR NEUTRAL OPERATION IN PREFERENCE TO THE NEUTRAL RELAYS WITH WHICH MOST AMATEURS ARE FAMILIAR (MAGNET OPERATED, SPRING RETURNED). THIS IS ACCOMPLISHED BY "BIASED" OPERATION OF THE RELAY.

TO OPERATE A POLAR RELAY IN A NEUTRAL CIRCUIT A "BIAS" CURRENT OF 30 M.A. IS PASSED THROUGH ONE OF THE TWO WINDINGS ON THE RELAY IN THE DIRECTION TO MOVE THE ARMATURE TO THE "SPACE" CONTACT (GENERALLY THE LEFT-HAND CONTACT). THE 60 M.A. CURRENT FROM THE NEUTRAL LINE IS SENT THROUGH THE OTHER COIL IN THE DIRECTION TO OVERPOWER THE "BIAS" MAGNETIZATION AND MOVE THE ARMATURE TO THE "MARKING" CONTACT. NO RETRACTING SPRING IS USED. THE 30 M.A. AND THE 60 M.A. ARE NORMALLY SECURED FROM THE SAME SOURCE SO THAT NO DISTORTION OF THE SIGNAL WILL OCCUR IF THE LINE CURRENT VARIES BECAUSE OF GENERATOR OUTPUT VARIATIONS OR OTHER CAUSES.

A COMMON ERROR OF RADIO AMATEURS IS TO CONSIDER THAT A LOW-VOLTAGE POWER-SOURCE WILL BE AS SATISFACTORY FOR OPERATING SENSITIVE RELAYS AS A HIGH-VOLTAGE SOURCE. FOR EXAMPLE; TO PASS 60 M.A. THROUGH ONE OF THE 85-OHM WINDINGS OF A 215-A RELAY REQUIRES A POTENTIAL OF ABOUT 2.5 VOLTS BUT, COMMERCIALY, A 120 VOLT SUPPLY IS USED WITH A 2000-OHM "BATTERY-TAP" RESISTOR. IT IS ESSENTIAL THAT THIS PROCEDURE BE FOLLOWED BECAUSE LACK OF SUFFICIENT SERIES-RESISTANCE WILL MAKE THE INDUCTANCE OF RELAY COIL DETERMINE THE RATE OF BUILD-UP AND DECAY OF THE CURRENT. BY "SWAMPING" THE INDUCTANCE WITH A LARGE SERIES RESISTANCE THE RELAY CURRENT WILL BE RELATIVELY INDEPENDENT OF THE INDUCTANCE OF THE COIL. THE IMPORTANCE OF THIS WILL BE SEEN WHEN ONE REALIZES THE RELAY MUST MAKE ITS TRANSITION FROM MARK-TO-SPACE OR VICE-VERSA IN MUCH LESS THAN A THOUSANDTH PART OF A SECOND.

THE EQUIVALENT TO POLAR-SENDING ON A WIRE-TELEGRAPH LINE IS RADIO FREQUENCY-SHIFT KEYING. IN BOTH SYSTEMS NO RELIANCE IS PLACED ON A SPRING-RETURNED ARMATURE DURING THE "SPACING" SIGNALS. RATHER THAN THAT AN ADDITIONAL SIGNAL IS TRANSMITTED DURING THE SPACING INTERVALS TO RESTORE THE RECEIVING APPARATUS TO THE SPACING CONDITION DESPITE NOISE OR VARIATION IN THE STRENGTH OF THE SIGNALS. 73 DE W2BFD

4 THE NORTHERN RADIO COMPANY MODEL 152 TONE CONVERTER
BY JOHN WILLIAMS, W2BFD

FOR A COUPLE OF YEARS AMATEUR RADIOTELETYPE "HEADQUARTERS" HAS BEEN AWARE THAT NORTHERN RADIO HAD SOMETHING EXCEPTIONAL IN THE WAY OF A FREQUENCY-SHIFT CONVERTER BUT, UNTIL VERY RECENTLY, WE HAVE BEEN UNABLE TO GET THE "INSIDE DOPE" ON HOW WE COULD DUPLICATE THIS SIMPLE, YET AMAZINGLY EFFECTIVE, UNIT. COMPOSED MAINLY OF RESISTORS AND CONDENSERS ITS COST SHOULD BE VERY LOW AND ASSEMBLY EASY.

AT PRESENT THE IDEA EMBODIED IN THE MODEL 152 HAS BEEN CONFINED TO VERY NARROW SHIFT CHANNELS "STACKED" CLOSELY ON WIRE TELEGRAPH LINES. THERE IS NO REASON WHY AMATEURS MAY NOT ADAPT THIS CIRCUIT TO OUR STANDARD 850 CYCLE SHIFT WITH EXCELLENT RESULTS. USING PULSE TECHNIQUES, THIS CIRCUIT ELIMINATES THE NEED FOR SEPARATE MARKING AND SPACING DISCRIMINATING AMPLIFIERS. UNLIKE THE FORSTER-SEELEY DISCRIMINATOR CIRCUIT WHICH REQUIRES A SPECIAL TRANSFORMER (TWO SPECIAL TRANSFORMERS IN THE WESTERN UNION TYPE 20 VERSION) THE NORTHERN RADIO DISCRIMINATOR CIRCUIT DETERMINES THE "CENTER-FREQUENCY" WITH A SINGLE PARALLEL-RESONANT COIL-CONDENSER COMBINATION. THE "CENTER-FREQUENCY" CAN BE PLACED ANYWHERE IN THE AUDIO-FREQUENCY RANGE BY ADJUSTMENT OF THE VALUES OF THIS COIL AND CONDENSER. FINE ADJUSTMENT CAN BE HAD WITH A TRIMMER.

THE AMAZING THING ABOUT THE MODEL 152 DISCRIMINATOR IS THE RAPIDITY OF ITS TRANSITION. ONCE YOU HAVE SET THE "CENTER FREQUENCY" THE OUTPUT OF THE CONVERTER WILL BE ALL "MARKING" (60 M.A. CURRENT FLOW THROUGH PRINTER SELECTOR MAGNET) WHEN YOU HAVE MOVED LESS THAN 2 CYCLES (TWO CYCLES!) TO THE MARKING SIDE OF CENTER FREQUENCY! WITH THE RECEIVED SIGNAL 2 CYCLES ON THE OTHER SIDE OF CENTER THE OUTPUT IS ALL "SPACING" (ZERO OUTPUT CURRENT TO PRINTER MAGNET). THIS MAY SOUND DIFFICULT TO SWALLOW BUT, SO HELP US, IT IS THE TRUTH.

BY COMBINING THE DISCRIMINATOR PARALLEL-RESONANT CIRCUIT AND AN INPUT BAND-FILTER INTO A PLUG-IN UNIT THE SAME TYPE OF CONVERTER CAN BE USED FOR ALL OF THE TELEGRAPH CHANNELS ON ONE LINE BY MERELY PLUGGING IN FILTERS WITH THE PROPER CHANNEL NUMBERS. AMATEURS, LIMITED BY PRESENT F.C.C. REGULATION TO 850 CYCLE SHIFT, WILL NOT FIND THE PLUG-IN FEATURE NECESSARY. A FREQUENCY-DOUBLING CIRCUIT, INCORPORATED INSIDE THE PLUG-IN UNITS FOR THE LOW-FREQUENCY CARRIER CHANNELS (BUT NOT IN THE UPPER CHANNELS), IS USEFUL, COMMERCIALY, IN REDUCING DISTORTION. AMATEURS, AT PRESENT, WILL PROBABLY FIND LITTLE USE FOR THIS FEATURE. IT IS POSSIBLE THAT FAIR OPERATION MAY BE HAD BY USING THE UNIT FOR AMATEUR RADIOTELETYPE RECEPTION WITHOUT THE INPUT BAND-FILTER BUT, CERTAINLY, THE ABILITY TO REJECT NOISE AND NON-TELETYPE SIGNALS WILL BE DIMINISHED.

THE INPUT SIGNAL (AFSK OR FSK-CONVERTED-TO-AFSK BY YOUR BFO) AT AUDIO FREQUENCY IS PASSED THROUGH THE PRELIMINARY BAND-FILTER AND THEN THROUGH A GROUND-ISOLATING LINE-TO-GRID AUDIO TRANSFORMER, T-2. IN THE COMMERCIAL VERSION OF THE "152" NO GROUND IS PLACED ON THE VACUUM-TUBE CIRCUITS THEMSELVES (AT D.C.) THUS PERMITTING TAKING THE D.C. OUTPUT TO THE PRINTER THROUGH A GROUNDED TELEGRAPH LINE IF NECESSARY. FOR AMATEUR WORK THE INPUT TRANSFORMER MAY BE ELIMINATED IF THE NEGATIVE PLATE SUPPLY TERMINAL IS GROUNDED.

V-1 IS OPERATED AS A SPLIT-LOAD AMPLIFIER, WHICH PROVIDES A PUSH-PULL OUTPUT FOR THE CRYSTAL-DIODE FREQUENCY-DOUBLING RECTIFIER CR-3 AND CR-4. THE OUTPUT OF THIS DIODE APPEARS ACROSS R-5 AND, WHILE ALWAYS PRESENT, IT IS ONLY USED, AS MENTIONED PREVIOUSLY, ON THE LOWER AUDIO-FREQUENCY CHANNELS. IN FUNDAMENTAL OPERATION (AMATEURS WILL PROBABLY USE THIS METHOD ONLY) THE OUTPUT IS TAKEN FROM R-1 AND THROUGH A STRAP ON THE PLUG-IN NETWORK FED DIRECTLY TO THE LIMITER, V-2.

IN SECOND-HARMONIC OPERATION, THE FULL-WAVE VOLTAGE IS FED TO THE RIGHT-HAND SECTION OF V-1, WHICH IS A CATHODE FOLLOWER, THE OUTPUT OF WHICH DRIVES A SERIES-RESONANT CIRCUIT LOCATED IN THE PLUG-IN NETWORK. THIS CIRCUIT CONSISTS OF AN INDUCTOR L-101 AND CAPACITORS C-104 TO C-107 THESE CAPACITORS SERIES-TUNE THE INDUCTOR TO THE SECOND-HARMONIC OF THE INPUT FREQUENCY. THE OUTPUT IS TAKEN ACROSS THE CAPACITORS OF THIS SERIES-RESONANT CIRCUIT AND IS APPLIED TO THE LIMITER, V-2.

EITHER THE FUNDAMENTAL SIGNAL FREQUENCY OR THE DOUBLED OUTPUT ARE APPLIED TO TUBE V-2 WHICH CONSISTS OF TWO HIGH-GAIN OVERDRIVEN AUDIO STAGES. THE OUTPUT FROM THE SECOND SECTION OF LIMITER V-2 CONSISTS OF A SQUARE-WAVE AT THE FREQUENCY OF THE INPUT TONE. THIS AUDIO-FREQUENCY SQUARE WAVE IS APPLIED TO THE FREQUENCY-DISCRIMINATOR CIRCUIT WHICH FOLLOWS.

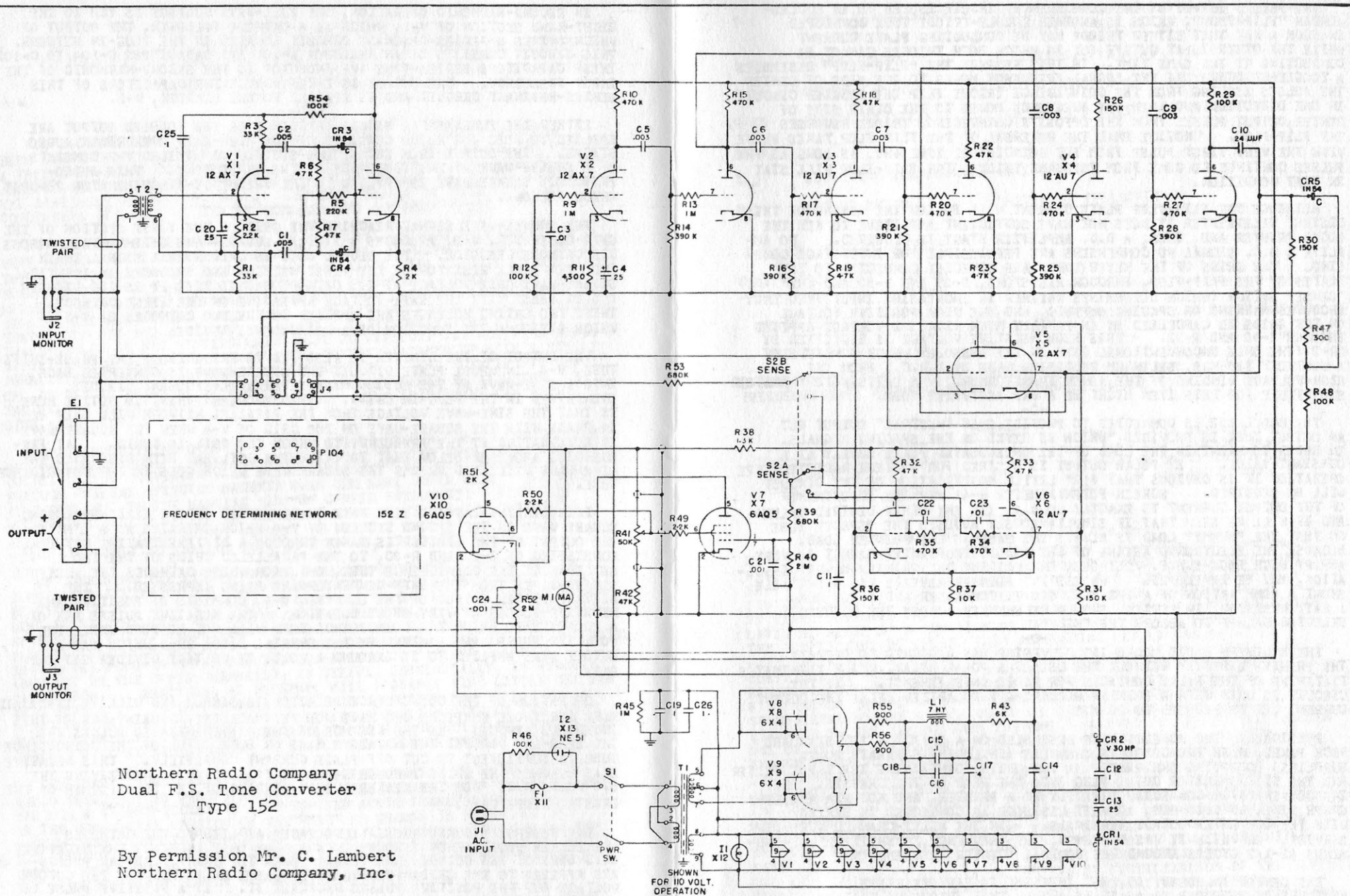
THE SQUARE-WAVE SIGNAL REACHING THE GRID OF THE FIRST SECTION OF THE GATE-GENERATOR, V-3, PRODUCES A SIMILAR SQUARE-WAVE GATE-VOLTAGE ACROSS ITS CATHODE RESISTOR. THE SECOND GRID IS DRIVEN BY A SIGNAL TAKEN FROM THE PLATE RESISTOR OF THE FIRST SECTION AND PRODUCES AN IDENTICAL SQUARE-WAVE GATE-VOLTAGE AT ITS CATHODE EXCEPT THAT IT IS 180 DEGREES OUT OF PHASE WITH THE GATE-VOLTAGE APPEARING ON THE FIRST CATHODE. THESE TWO GATING VOLTAGES ARE APPLIED TO THE TWO CATHODES OF V-5 WHICH PERFORMS THE FUNCTION OF A COINCIDENCE DEVICE.

THE OUTPUT OF THE LIMITER IS ALSO FED TO THE GRID OF THE PHASE-SHIFT TUBE, V-4, IN WHOSE PLATE CIRCUIT THE SQUARE-WAVE IS CONVERTED BACK INTO A SINE-WAVE BY THE ACTION OF THE PARALLEL-RESONANT CIRCUIT (CONTAINED IN THE PLUG-IN UNIT). THE IMPORTANT THING TO NOTICE HERE IS THAT THE SINE-WAVE VOLTAGE FROM THE PARALLEL NETWORK WILL ONLY BE IN PHASE WITH THE SQUARE-WAVE ON THE GRID OF V-4 WHEN THE SQUARE-WAVE IS ALTERNATING AT THE FREQUENCY TO WHICH THE COIL IS TUNED. AT FREQUENCIES ABOVE OR BELOW THAT TO WHICH THE COIL HAS BEEN RESONATED THE SINE-WAVE WILL LEAD OR LAG THE SQUARE WAVE WHICH GOES TO THE COINCIDENCE TUBE.

THIS LEADING-LAGGING SINE WAVE IS CONVERTED INTO A LEADING-LAGGING SQUARE WAVE IN THE SECOND SECTION OF V-4 WHICH OPERATES AS A LIMITER. THE OUTPUT OF THE LIMITER IS TAKEN THROUGH A DIFFERENTIATING NETWORK, CONSISTING OF C-10 AND R-30, TO THE PARALLELED GRIDS OF THE TWO SECTIONS OF THE COINCIDENCE TUBE, V-5, (ON WHOSE CATHODES THE PUSH-PULL SQUARE-WAVES FROM THE GATE-GENERATOR ARE BEING IMPRESSED). THE DIFFERENTIATED OUTPUT OF THE LIMITER, V-4, CONSISTS OF POSITIVE AND NEGATIVE PULSES OF VERY SHORT DURATION. THE NEGATIVE PULSES ARE OF A POLARITY TO WHICH THE COINCIDENCE TUBE WILL NOT RESPOND WHILE THE POSITIVE PULSES ARE LIMITED BY THE CRYSTAL DIODE CR-5 WHICH HAS A CUTOFF BIAS APPLIED TO IT (AROUND 1 VOLT) BY VOLTAGE DIVIDER R47 AND R48.

OPERATION OF THE COINCIDENCE SELECTOR IS SIMPLE AND WILL BE EXPLAINED HERE FOR THOSE AMATEURS WHO HAVE NOT YET MADE THE ACQUAINTANCE OF THIS INGENIOUS DEVICE. IN THE ABSENCE OF THE DIFFERENTIATED PULSES FROM THE LEAD-LAG CIRCUIT THE NEGATIVE BIAS ON BOTH GRIDS OF THE COINCIDENCE TUBE IS SUFFICIENT TO CUT OFF PLATE CURRENT COMPLETELY. THIS NEGATIVE BIAS REACHES THE GRIDS THROUGH R-30 AND IS DERIVED BY RECTIFYING THE 6.3 VOLTS A.C. FROM THE HEATER SUPPLY WINDING OF THE TRANSFORMER IN THE CRYSTAL DIODE CR-1.

THE PUSH-PULL SQUAREWAVE GATE VOLTAGES APPLIED TO THE CATHODES ARE EITHER POSITIVE OR ZERO AND, THUS, CAN ONLY INCREASE THE NEGATIVE GRID BIAS OF THE COINCIDENCE TUBE. WHEN THE SHARP LEAD-LAG PULSES ARE APPLIED TO THE GRIDS THE NEGATIVE PULSES ONLY INCREASE THE CUTOFF VOLTAGE BUT THE POSITIVE PULSES DECREASE IT. IF A POSITIVE PULSE ARRIVES AT THE GRID AT THE SAME TIME THAT THE RESPECTIVE CATHODE IS BEING DRIVEN POSITIVE BY THE SQUARE WAVE NOTHING HAPPENS BUT, IN THE OTHER TRIODE, THE POSITIVE GRID PULSE IS OCCURRING AT THE INSTANT THAT THE CATHODE IS RECEIVING THE "ZERO" PORTION OF THE GATING SQUARE WAVE AND A SHARP PULSE OF PLATE CURRENT WILL FLOW MOMENTARILY. PULSES OF PLATE CURRENT WILL OCCUR ONCE DURING EVERY CYCLE OF THE SIGNAL FREQUENCY IN ONE OR THE OTHER TRIODE OF THE COINCIDENCE SELECTOR UNTIL THE FREQUENCY SHIFTS TO THE OTHER SIDE OF "CENTER FREQUENCY".



Northern Radio Company
 Dual F.S. Tone Converter
 Type 152

By Permission Mr. C. Lambert
 Northern Radio Company, Inc.

- NOTES:
 1. ALL RESISTANCES IN OHMS
 2. ALL CAPACITANCES IN MICROFARADS
 UNLESS OTHERWISE SPECIFIED

8 THE PULSED OUTPUT OF THE COINCIDENCE CIRCUIT IS LED TO AN ECCLES-JORDAN "FLIP-FLOP", WHICH IS ANOTHER DOUBLE-TRIODE TUBE CONNECTED IN SUCH A WAY THAT EITHER TRIODE MAY BE CONDUCTING PLATE CURRENT WHILE THE OTHER IS AT CUTOFF BUT IN WHICH BOTH TRIODES CANNOT BE CONDUCTING AT THE SAME TIME. IN THIS RESPECT THE "FLIP-FLOP" RESEMBLES A TOGGLE-SWITCH. IF THE SIGNAL FREQUENCY MOVES TO ONE SIDE OF CENTER THE PULSES ISSUING FROM THE COINCIDENCE TRIODE FLIP THE TRIGGER CIRCUIT IN ONE DIRECTION AND, WHEN THE FREQUENCY MOVES TO THE OTHER SIDE OF CENTER, OUTPUT PULSES FROM THE OPPOSITE COINCIDENCE TRIODE REVERSES THE FLIP-FLOP. NOTICE THAT THE REVERSAL OF THE FLIP-FLOP TAKES PLACE WITH THE VERY FIRST PULSE FROM THE COINCIDENCE TUBE AND, AS LONG AS THE PULSES CONTINUE TO COME FROM THE SAME TRIODE, THE FLIP-FLOP WILL STAY IN THAT CONDITION.

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ALTHOUGH THE FLIP-FLOP PLATE CURRENT WILL FOLLOW THE KEYING OF THE DISTANT TELEPRINTER IT DOES NOT HAVE SUFFICIENT AMPLITUDE TO KEY THE LOCAL PRINTER AND, THUS, A D.C. AMPLIFIER STAGE IS REQUIRED. TO AMPLIFY A D.C. SIGNAL NO CONDENSERS ARE PERMISSIBLE FOR INTERSTAGE COUPLING. THE GRIDS OF THE KEYS TUBES ARE DIRECTLY CONNECTED TO THE PLATES OF THE FLIP-FLOP, THROUGH RESISTORS, R-39 AND R-53 AND THE "SPACE" SWITCH (WHICH DETERMINES WHETHER AN INCREASING INPUT FREQUENCY PRODUCES MARKING OR SPACING OUTPUT), AND THE HIGH POSITIVE VOLTAGE ON THE GRIDS IS CANCELLED BY AN EQUALLY HIGH NEGATIVE VOLTAGE APPLIED THROUGH R-40 AND R-52. THIS HIGH NEGATIVE VOLTAGE IS RECTIFIED BY CR-2 (THE ONLY UNCONVENTIONAL ITEM IN THE ASSEMBLY WHICH CONSISTS OF A 600 VOLT 1.5 M.A. SELENIUM RECTIFIER MADE BY I.R.G.) FROM THE HIGH-VOLTAGE WINDING OF THE POWER TRANSFORMER. A SATISFACTORY AMATEUR SUBSTITUTE FOR THIS ITEM MIGHT BE A 6X5 RECTIFIER TUBE.

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THE MODEL 152 IS CONNECTED TO PROVIDE ONLY "NEUTRAL" OUTPUT BUT AN OUTPUT TUBE IS PROVIDED, WHICH IS KEYED ON THE SPACING SIGNALS, IN ORDER TO MAINTAIN THE LOAD ON THE UNREGULATED PLATE SUPPLY AT A CONSTANT VALUE. IF POLAR OUTPUT IS DESIRED FOR AMATEUR RADIOTELETYPE OPERATION IT IS OBVIOUS THAT VERY LITTLE MODIFICATION OF THE CIRCUIT WILL BE REQUIRED. SCREEN POTENTIOMETER R-41 PERMITS ADJUSTMENT OF THE OUTPUT CURRENT TO EXACTLY 60 M.A. (OR ANY OTHER DESIRED VALUE) AND IT WILL BE SEEN THAT IT SIMULTANEOUSLY ADJUSTS THE "SPACE" TUBE SO THAT THE "DUMMY" LOAD IS ALWAYS THE SAME AS THE PRINTER LOAD. BECAUSE THE ELECTRONIC KEYING OF THE INDUCTIVE PRINTER-MAGNET IS VERY ABRUPT HIGH BACK-E.M.F. VOLTAGES, ENDANGERING THE PRINTER-MAGNET INSULATION, MAY BE DEVELOPED. UNLESS THE PRINTER ALREADY HAS A SUITABLE SHUNT A COMBINATION OF A 1/2 M.F. 600 V. CONDENSER AND A 100 OHM 1 WATT RESISTOR, IN SERIES, SHOULD BE SHUNTED ACROSS THE PRINTER SELECTOR MAGNET TO ABSORB THE "KICK".

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THE NORTHERN RADIO MODEL 152 CONVERTER WAS DESIGNED TO OPERATE THE PRINTER DIRECTLY WITHOUT THE USE OF A POLAR RELAY, WHICH ELIMINATES FILTERING OF THE RELAY CONTACTS FOR RADIO INTERFERENCE. IF THE CIRCUIT IS USED WITH A PRINTER REQUIRING A POLARIZED RELAY THE OUTPUT CURRENT CAN BE REDUCED TO 20 M.A.

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PHYSICALLY, THE MODEL 152 IS ASSEMBLED ON A 3-1/2" X 19" STANDARD RACK PANEL, WITH TWO COMPLETE CHANNELS (INCLUDING SEPARATE POWER SUPPLIES) OCCUPYING ONE PANEL. THE UNITS, CONTAINING THE INPUT FILTER AND THE DISCRIMINATOR COIL, PLUG INTO THE REAR OF THE CHASSIS. IF THE CONVERTER IS CONNECTED DIRECTLY TO A PRINTER, AND NOT VIA A TELEGRAPH LINE, AN 1800 OHM, 10 WATT RESISTOR IS CONNECTED IN SERIES WITH THE CONVERTER OUTPUT TERMINALS. IN THE MULTI-CHANNEL WIRE-LINE SERVICE, FOR WHICH IT WAS DESIGNED, THE FREQUENCY IS SHIFTED PLUS-AND-MINUS 42-1/2 CYCLES AROUND THE NOMINAL "CENTER FREQUENCY".

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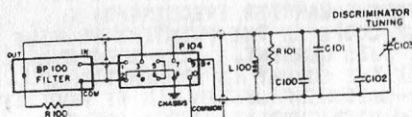
THE CENTER FREQUENCY OF MOST INTEREST TO RADIOTELETYPE AMATEURS IS 2550 C.P.S. AS IT IS AROUND THAT FREQUENCY THAT WE SHIFT PLUS-AND-MINUS 425 C.P.S. UNFORTUNATELY, NONE OF THE DATA PROVIDED BY NORTHERN RADIO COMPANY GIVES US VALUES FOR USING THIS CENTER FREQUENCY BUT THEIR CHANNELS AT 2465 AND 2635 C.P.S. "BRACKET" THE DESIRED RANGE AND IT SHOULD BE FAIRLY SIMPLE TO INTERPOLATE. THE FOLLOWING IS A LIST OF THOSE FEW PARTS NOT COMPLETELY IDENTIFIED IN THE DRAWING:-

T-1	POWER TRANSFORMER	SECONDARY:- 295-0-295 V. AT 90 M.A. SECONDARY:- 6.3 V. AT 2. AMPS.
L-1	FILTER CHOKE	7 HENRIES, 110 M.A., 160 OHMS D.C.
R-41	OUTPUT CONTROL	50,000 OHMS, 2 WATT POTENTIOMETER
R-55	FILTER RESISTANCE	900 OHMS, 5 WATTS, WIREWOUND
R-56	" "	" " " " " "
T-2	ISOLATION TRANSFORMER	LINE-TO-GRID
M-1	OUTPUT METER	0-75 M.A. FULLSCALE

DATA ON PLUG-IN UNITS:-

CENTER-FREQUENCY	C-100	C-101	C-103	L-100
-----	-----	-----	-----	-----
2465 C.P.S.	.01	.001	1300-2830 MMF	.3 HENRY TOROID
2635 C.P.S.	.01	.005	" " " "	.2 " "

C-102, C-104, C-105, C-106, C-107, L-101, R-101 NOT USED AT THESE FREQUENCIES. VALUES GIVEN FOR CHANNELS 14 AND 15



This is the circuit of a non-doubling plug-in discriminating unit. The BP100 filter is any band-pass filter.

.....and W6CLW sends this one in:

DR OSSIP SCHMALDPFFLE OF THE UNIVERSITY OF KORPERWURST ANNOUNCES DISCOVERY THAT ALL FLIES INCIDENT UPON FLYPAPER DO NOT STICK BUT THAT THERE IS A FINITE PROBABILITY OF A FLY REBOUNDING WITH A FINITE VELOCITY. HIS RESEARCHES CONDUCTED OVER A PERIOD OF 29 YEARS INDICATE THAT THE COEFFICIENT OF CREEP IN A MONOMOLECULAR LAYER OF FLIES IS A FUNCTION OF THE ENTROPY OF THE FLIES AND THE COEFFICIENT OF CREEP. THIS ASTOUNDING RESULT WAS OBTAINED WITH THE AID OF A SPECIAL FLYPAPER HAVING A VERY HIGH STICKINESS COEFFICIENT, WHICH CREATED A GRAVE HAZARD FOR THE OPERATING PERSONNEL BECAUSE AIR MOLECULES ALSO STUCK TO IT, PRODUCING A HIGH VACUUM IN THE LABORATORY, WHICH NEARLY SUFFOCATED DR. SPLOPSIZZLE BEFORE A DOOR COULD BE OPENED. THIS GREAT WORK WAS FINANCED BY THE INCOME FROM THE BASIC PATENTS ON THE FLY RADIOMETER ONE OF WHICH, INSTALLED IN THE MOSCOW GRAND HOTEL, GENERATES ENOUGH POWER TO LIGHT AND HEAT THE HOTEL. THE FLY RADIOMETER DR. SCHMALPBIFFLE EXPLAINED, HAS 4 VANES WHICH ARE ALTERNATELY COATED WITH FLYPAPER AND LEFT BARE. FLIES HITTING THE FLYPAPER STICK, WHERE AS THOSE HITTING THE BARE SIDES OF THE VANES REBOUND, WITH A CONSEQUENTLY INCREASED MOMENTUM TRANSFER WHICH IS SUFFICIENT TO SPIN THE VANES RAPIDLY AND GENERATE POWER BY AN ALTERNATOR CONNECTED THERETO. THIS WORK, DR. SPLURPSOZZLE NOTED, IS CLOSELY RELATED TO HIS RECENT RESEARCHES ON THE ENHANCEMENT OF REALISM IN TOUPEES BY FERTILIZATION OF THE SURFACE PERMITTING DANDRUFF TO GROW NATURALLY. ROYALTIES FROM THE 3-D TOUPEE COMPANY HAVE FINANCED SUCH BASIC WORK AS THE MEASUREMENT OF THE VISCOSITY OF BEER AS A FUNCTION OF AGE, AND THE PRODUCTION OF EGGS FROM THE HEN AS A FUNCTION OF THE MEAN FREE PATH BETWEEN INELASTIC COLLISIONS WITH A ROOSTER. FOR THE LATTER WORK DR S SPLURPSOGGLE WAS RECENTLY AWARDED THE ORDER OF THE GOLDEN WATTLE, WITH FRIED EGG CLUSTERS.

AMATEURS USING SINGLE-MAGNET TELETYPEWRITERS SUCH AS MODELS 14, 15, 19, 24, 26, 28, 31 AND WESTERN UNION -100 SERIES MACHINES AND CREED, AUTOMATIC ELECTRIC AND KLEINSCHMIDT PRINTERS HAVE ASKED HOW THESE MACHINES MAY BE CONNECTED WITH BOTH MODELS OF THE STANDARD "W2BFD" PANEL.

THE SIMPLE SERIES CIRCUIT OF A 2000 OHM WIRE-WOUND RESISTOR, THE ARMATURE AND "MARK" CONTACTS OF THE POLAR RELAY, THE PRINTER MAGNET AND THE 120 VOLT D.C. CURRENT SUPPLY OBTAINED FROM TERMINALS 8 & 9 OF THE 11-PIN CONNECTOR ON THE PANEL IS ALL THAT IS NEEDED. NO CHANGES NEED BE MADE IN THE PANEL ITSELF. THE ITEMS MENTIONED MERELY CONNECT TO AN 11-PIN (FEMALE) CONNECTOR MATING WITH THE PANEL (MALE) CHASSIS CONNECTOR.

IT IS STANDARD WIRE-LINE TELEGRAPH PRACTICE TO USE WHAT IS KNOWN AS 60 M.A. LOOPS. THESE CONSIST OF A SOURCE OF -120 VOLTS D.C. A 2000 OHM "BATTERY TAP RESISTOR", AND SEVERAL SERIES-CONNECTED FONE JACKS OF THE CLOSED-CIRCUIT VARIETY THAT SHORT CIRCUIT THEMSELVES WHENEVER THE PLUG IS WITHDRAWN. INTO ANY ONE OF THESE JACKS YOU CAN PATCH A FONE PLUG CONTAINING THE CONTACTS OF THE POLAR RELAY. INTO ANOTHER YOU CAN PATCH A SINGLE-MAGNET PRINTER AND STILL ANOTHER MAY BE USED FOR REPERFORATORS ETC. AS THE MAGNETS ARE OF LOW RESISTANCE COMPARED WITH THE 2000 OHM RESISTANCE NO READJUSTMENT NEED BE MADE IN THE CURRENT WHEN PLUGS ARE INSERTED OR WITHDRAWN. A SEPARATE 60 M.A. LOOP CAN CONTAIN A SENDING POLAR RELAY AND INTO THE SERIES-CONNECTED JACKS IN THIS LOOP CAN BE PLUGGED KEYBOARDS, TAPE TRANSMITTERS OR THE RECEIVING-RELAY CONTACTS OF A DUPLEX CIRCUIT (IN ORDER TO RE-TRANSMIT A RECEIVED SIGNAL ON A DIFFERENT CARRIER FREQUENCY). A 0-100 M.A. METER SHOULD BE IN THESE LOOPS AS THE PRINTERS PROVIDE MINIMUM DISTORTION OF THE SIGNALS AT THIS CURRENT. THE 2000 OHM RESISTORS MAY HAVE TO BE INCREASED IF THE SUPPLY IS SUBSTANTIALLY OVER 120 VOLTS. THE INTERNAL METER-SWITCHING SYSTEM CAN BE MODIFIED TO INCLUDE A METHOD OF MONITORING THE LOOP CURRENT. (ONCE SET THE CURRENT IS UNLIKELY TO VARY SO IT IS NOT VERY IMPORTANT TO HAVE A PERMANENT METER IN THE LOOP).

ON THE LATEST PANEL THE "RETRANSMIT" RELAY (SECOND FROM THE TOP OF THE PANEL) CAN BE USED TO OPERATE SINGLE-MAGNET PRINTERS OR REPERFORATORS WHILE THE TOP RELAY CAN OPERATE A 5-MAGNET PRINTER SIMULTANEOUSLY.

A TRICK RESORTED TO IN COMMERCIAL TELETYPE WORK WHEN THE D.C. 120 VOLT SUPPLY DOES NOT HAVE GOOD REGULATION IS TO KEY THE SINGLE-MAGNET PRINTER WITH THE "MARKING" CONTACT OF THE POLAR RELAY AND CONNECT A "DUMMY" LOAD RESISTANCE TO THE "SPACING" CONTACT OF A VALUE CALCULATED TO DRAW APPROXIMATELY THE SAME CURRENT AS THE PRINTER. THE OUTPUT FILTER CONDENSER IN THE RECTIFIER UNIT CANNOT APPRECIABLY CHARGE UP DURING THE SPLIT-MILLISECOND INTERVAL THE ARMATURE OF THE RELAY IS IN TRANSIT AND, THUS, MAINTAINS THE VOLTAGE CONSTANT. 73 DE W2BFD

VE2ATC is the call that Lou Buck was just recently issued. Lou had let his old license expire and, with the impetus of teletype, recently decided to get back on the air again. Lou has helped a lot of the Canadian gang get their printers and it will be swell being able to work him on the air. Naturally his first out of town contact was Bob, W9TCJ. He also contacted VE3GL in Toronto, which is doing well considering that he is only running 75 watts to a 12 foot whip antenna.

Though things are supposed to die down in the Summer, I have been daily surprised at the number of letters coming in and wish to thank you for taking the trouble to write. With but two exceptions most of the letters register an interest in my occasional deviations from the RTTY line which to me is encouraging.....

DL4KA sent a hamgram saying, "I am all set here for radio teletype. Drop me a line via airmail if you or anyone else is interested in making a schedule. Martin E. Willson, 1945 AACCS Sqn. APO 57, Postmaster, N.Y., N.Y." There's some DX.

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