

Special Report for "RTTY"

FG7XT/FS7 AND PJ2 MI DX-PEDITION

Jean Wegimont, FG7XT, gathered his KWM2, Seimens T-68 miniature teleprinter and many other much needed accessories and flew in his friend's Piper Apache to French St. Marten's Island on April 27.

His first QSO on March 29th at 1735 GMT was with Rene, DL3 IR. His first QSO's with each country were with: DL3IR, PZ1AX, W8SDD, G3MWI, I1ORS, VE3GK, OA4BR, XE1YJ, SM6CSC, TG9AD and YV5HG.

His total RTTY QSO's were 242. Operation was concluded from /FS7 on May 7th at 1845 GMT.

At 2105 GMT that same day he began operating from the QTH of his friend, Jose, PJ2MI located in Dutch Sint Maartin's Island. RTTY contacts totalled: 42. The first QSO for each country was with: K3CIF, I1AHN, G3MWI, PZ1AX, DL3IR, F8KI, VE3GK, OA4BR, W6JIE/MM and VE3BIJ.

Jean's comments on the operation from both /FS7 and PJ2MI concern mainly the poor propagation conditions throughout the test period together with his experience that those stations using Narrow Shift usually made the best copy.

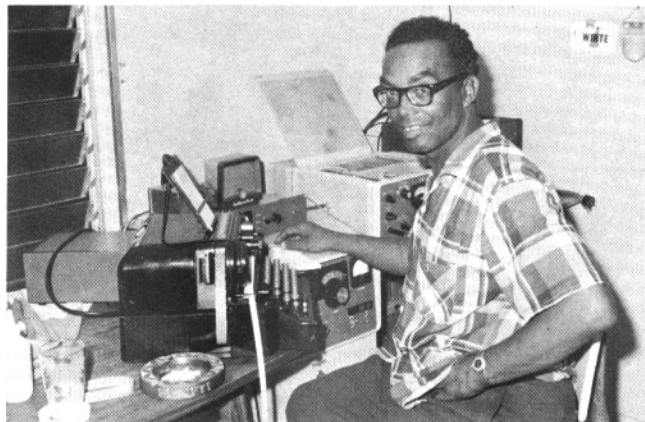
The main benefit to all those interested in RTTY DX was the addition of those two rare countries which Jean and Jose provided.

There are some side effects which should make life brighter for the DXers:

1. Jean is now even more determined to take the gear to other non-RTTY countries in the Caribbean—probably in the coming Summer or Autumn season.

2. Jose, PJ2MI, having had a good taste of RTTY operation would like to get on the air with the proper equipment as soon as possible.

Ed Clammer, May 24, 1965



THE W6ZH HETRODYNE T.U.

Several articles on hetrodyne terminal units have appeared in various amateur magazines in the past. The unit which will be described is the result of the availability of some very good narrow band pass filters. While some amateurs have built good band pass filters, it is usually a project requiring equipments and skills which are not readily available. The filters used in this TU are surplus units originally manufactured for Collins Radio. At least three different types are known to have been produced, 70, and two types of 100 cycle filters, measured at the 3 db. points. The seventy cycle filters were used in this TU. But it is felt that other band widths would not have effected the over all results by a noticeable amount.

One might ask, why use a hetrodyne type TU? Granted, that additional circuitry will be required. Several reasons come to mind. First, RTTY operation is growing rapidly, which results in crowded RTTY segments of our amateur frequencies. Newer RTTY stations do not, in all cases transmit with shifts of exactly 850 cycles, due to various causes. Stations operating in various parts of the country do not, in all cases hear each other, and as a result, may tune up and transmit on top of each other. The ability to separate closely spaced stations is desirable. Narrow shift RTTY operations have demonstrated the ability to give more solid RTTY contacts through QRM, both man made and static. The hetrodyne TU is a natural for NFSK operation where it has been shown that three NFSK (170 cycle shift) can operate in the same band width as a normal 850 cycle shifted RTTY station. Equipments such as the TU to be described is in keeping with the amateur tradition of improving communications.

For sake of clarity the unit has been broken down into four sections—mixer-filter section, amplifier-rectifier section, tuning indicator section, and the keyer power supply section. A drawing of the FSK adapter used by W6ZH with his 32S3 exciter is shown. External circuit requirements are modest. Input from the 500/600 OHM speaker terminals at no more power than is now required for the speaker. The teletype printer selector and keyboard plug into the jacks on the rear of the cabinet. No local loop supply is required. Provisions for driving the FSK adapter directly while obtaining page copy of the transmissions. A single switch controls the normal-

send-receive functions, and also a standby position.

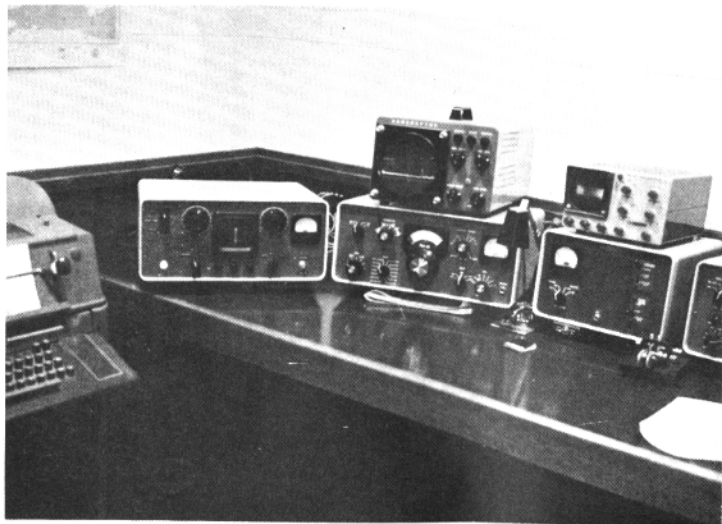
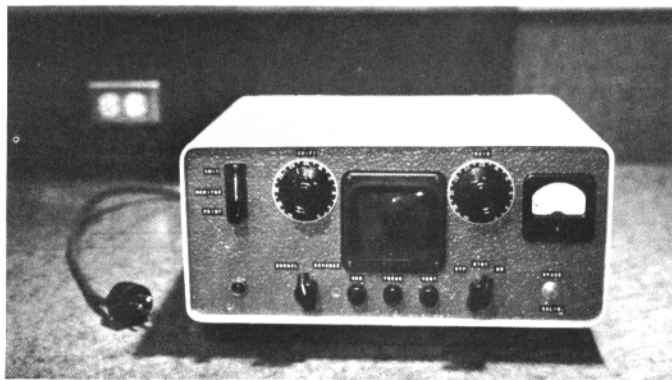
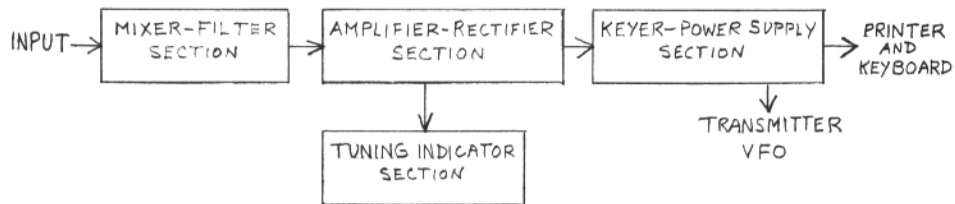
The normal TU uses frequencies of 2125 and 2975 cycles (1275 and 2125 for some of the Collins receivers). Unless one operates on two and six meters where AFSK is permitted, frequencies other than the above can be used. In fact, except for avoiding spurious frequencies from the sum and product of the oscillator and incoming signal, several other frequencies can be used. The filters for this TU were 1860 cycles for mark, and 1140 cycles for space. It is my opinion that for best results, the space frequency should be lower than the mark, to avoid spurious response within the oscillator tuning range. The oscillator tunes from approximately 3,000 to 4,000 cycles, which copies shifts from 0 to 1,000 cycle shift.

An incoming RTTY signal with 850 cycle shift tuned for mark signal at 1860 cycles and 2710 cycles space. The incoming signal mixed with the local oscillator at 3850 cycles produces sum and difference frequencies of 5710 and 1990 cycles for mark, and 6560 and 1140 cycles on space. The only signal out of these mixes which will pass through the filters is the desired one, 1140 cycles for space. The dial on the local oscillator in the TU, has been calibrated in shift widths. Such calibrations can be easily obtained by using the exciter's VFO or a AB-221 on LM frequency meter.

A good discussion on mixers can be found in any issue of the ARRL Radio Amateur's Handbook in the section covering superhetrodyne receivers (page 93). The hetrodyne oscillator is to be found on page 147 and is the series tuned colpitts, sometimes called the clapp oscillator. Surplus toroids and a small three gang broadcast receiver tuning capacitor were used for the tuning portion of the oscillator. Note, a series tuned trap was placed in the grid of the mixer to remove spurious "birdies" and "feed-through" on mark of the 1140 cycle signals. Coupling to the space filter from the plate of the mixer was through an interstage transformer from a command set. Any similar interstage transformer with a 20,000 to 600 OHM impedance ratio can be used. Both filters are terminated with resistors. Adjustment of the injection from the grid to the oscillator is provided by the small potentiometer in the mixer grid. A volume control for setting the amplitude of the signal, viewed on the scope to a level where clipping just starts is provided as is a switch for standby, and removing the spot on the scope when on standby.

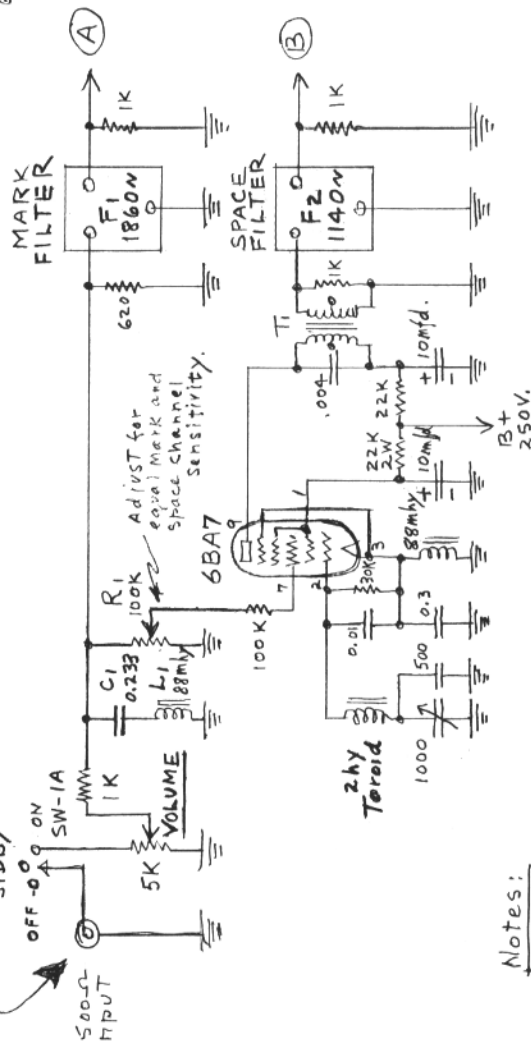
The amplifier-rectifier section has two

HETERODYNE T.U.
BLOCK DIAGRAM



Input Frequencies: { MARK = 1860 ~
SPACE = 1860 to 2860 ~
(Freq. Shift = 0 - 1000 ~)

HETERODYNE T.U.
MIXER-FILTER SECTION
6/8/65



Notes:

- F1 and F2 - Collins surplus Filters (approx. 70 ~ wide at 3Db points), Freq. of F1 and F2 not critical, except F2 should be lower than F1
- To minimize spurious responses within oscillator tuning range.
- Oscillator tunes from 3000 ~ to 4000 ~ ^{when used} with Filter Frequencies shown.
- Input Trap C1-L1 should be tuned to freq. of F2 to minimize direct signal feed-thru by mixer tube.
- T1 - 24,000 ~ / 500 ~ output transformer from Surplus Command Receiver.

stages of audio gain, following the filters. The mark and space channels are amplified separately. You will note the potentiometers which provide signals for the tuning indicator used as input resistors for the second stage. An additional feature of the second stage is the use of a 470,000 OHM resistor in series with the grid. Note, also the two pair of 1695 diodes connected across the grids to ground of this stage. The action of this series resistance and shunt diodes can be compared to an "L" pad, where the values of the shunt arm is the diodes, which varies with the input level. A range of approximately 40 db. is obtained. Hold-off bias is provided by the so-called contact potential of the diodes. The diodes hold a constant value of resistance until the incoming AC signal level exceeds the contact potential, and above this level, the resistance of the diodes drops, causing attenuation of the signal applied to the grid. This is a very simple form of automatic gain control and is effective. Using two pairs of diodes connected as shown, control of both positive and negative signals values is had. The outputs of the second stages are transformer coupled to the bridge rectifiers. The impedance ratio of the transformer is one to one, with a value of around 10,000 to 20,000 OHMS. The normal-reverse switch feeds the low pass filter comprised of the 350 Henry and .01 MFD capacitor tuned to approximately 85 cycles. The 12AT7 DC amplifier has a 1,000 OHM potentiometer in its cathode to permit adjustment of the mark and space for equal swings voltage at the plate of the 12AT7.

The keyer-power supply section has several features of interest. First the DC output from the 12AT7 is "AC" coupled to the 6W6-G keyer tube. Two 1695 diodes connected back to back are used to clamp the grid driving voltage on both positive and negative swings. Also a small 5,000 OHM relay is connected across the grid of the 6W6-G keyer to disable the audio input when transmitting, to avoid feedback troubles when copying on one's own frequency. Both the printer's selector magnet and keyboard are connected in series with the keyer tube plate to ground. The power supply has a grounded positive voltage to permit this "safety" feature. FSK DC drive voltage is derived from a 12AT7 connected across the cathode resistor of the 6W6-G keyer tube. A push button switch in the grid of the 12AT7 allows one to check both mark and space frequencies without transmitting. Local copy is provided by the keyboard, keying the selector magnet current, the power transformer is a 330-0-330 volt at 100 MA with a single 6.3 volt filament winding. A separate 6.3 volt filament transformer is used for the 3BP-1A scope indicator. Type 5E6 diodes were used for all of the power supplies, saving filament current and keeping the unit cooler. Chokes were used with electrolytic capacitors for filtering the DC supplies. A control switch for

"print"- "monitor" or "XMT" is shown and its use is obvious.

The tuning indicator portion of the TU uses a 12AT7 cathode follower to isolate the driving amplifier and also to provide a very low impedance source for the tuning indicator filters. The most critical item in the complete TU is the tuning of L4 and L5, C5 to the center frequencies of the mark and space filters. Turns were removed to adjust exact frequencies for both filters. The resulting pattern is a vertical cross. Mark is the vertical line in this TU, with space as the horizontal line. Note two cathode resistors in the 12AX7 tube were adjusted to give equal gain for both mark and space, this also compensating for the variation in sensitivity of the horizontal and vertical plates of the scope tube. Provision to blank the scope tube when the TU is on standby lengthens the life of the tube, and does not burn a spot on the center of the tube.

A circuit used at W6ZH for FSK-ing the 32S3B exciter is shown. Note the simple circuit required to give either 170 or 850 cycle shift.

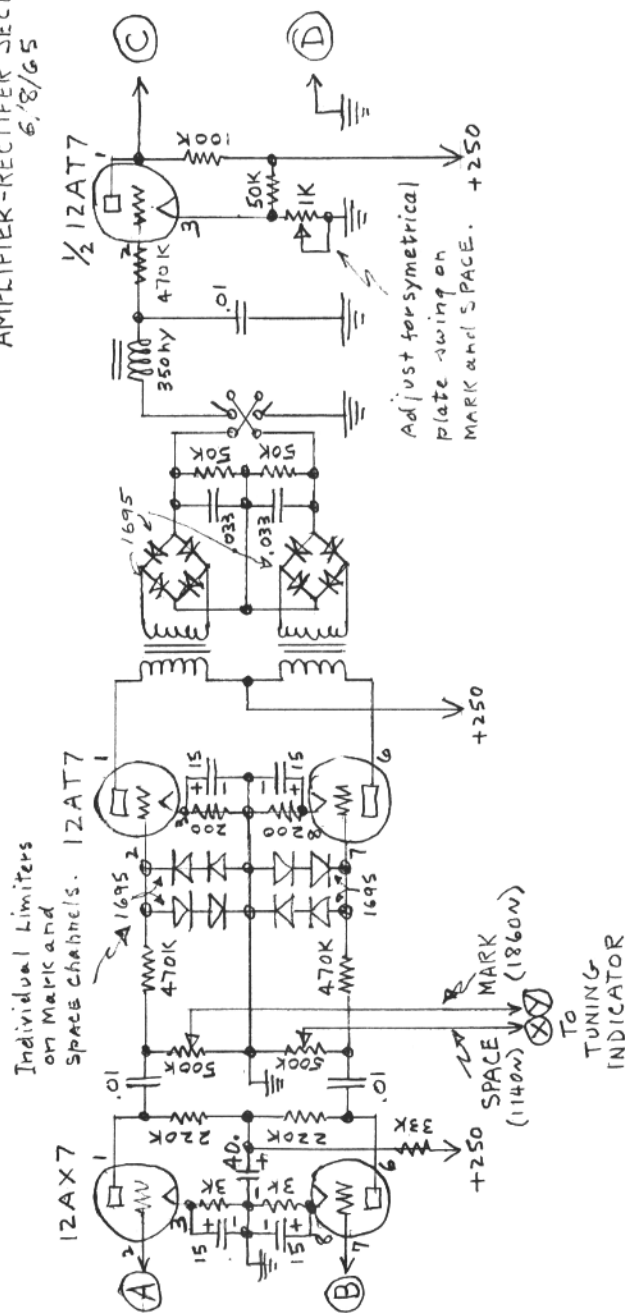
Operations with the hetrodyne TU is very easy. Tune for a mark signal on the vertical trace on the scope. Then adjust the local oscillator dial until the space (horizontal) line is maximum width. The input volume control should be adjusted to the point when a slight dropping in amplitude is noted when the control is reduced. Push the operate switch and sit back and read the copy. Of course if the signal copied is shifting in reverse, one should change the normal-reverse switch to correct for this small item.

No attempt has been made to give the limitations and all the advantages of the hetrodyne type of TU, but more as a "status report" of the present stage of development. The results to date are most encouraging. Copying NFSK is almost like being connected to a "land-line". With the availability of good band pass filters such as those which RTTY, Inc. is currently offering its readers, there is no valid reason for not constructing a similar TU. The circuit is no more complicated than many units that we build every day for use in our amateur stations. Cost is low, and results are well worth the effort. We also can operate with good copy on any reasonable shift, permitting better use of our limited RTTY segments of the amateur bands.

RTTY, Inc. wishes to extend thanks to Herbert Hoover, Jr., W6ZH for furnishing the drawings used and the many discussions of TUs and means to improve their operations. This W6ZH Hetrodyne TU will be shown at the National ARRL Convention at San Jose, California, July 2, 3, 4, 1965.

- 30 - W6AEE

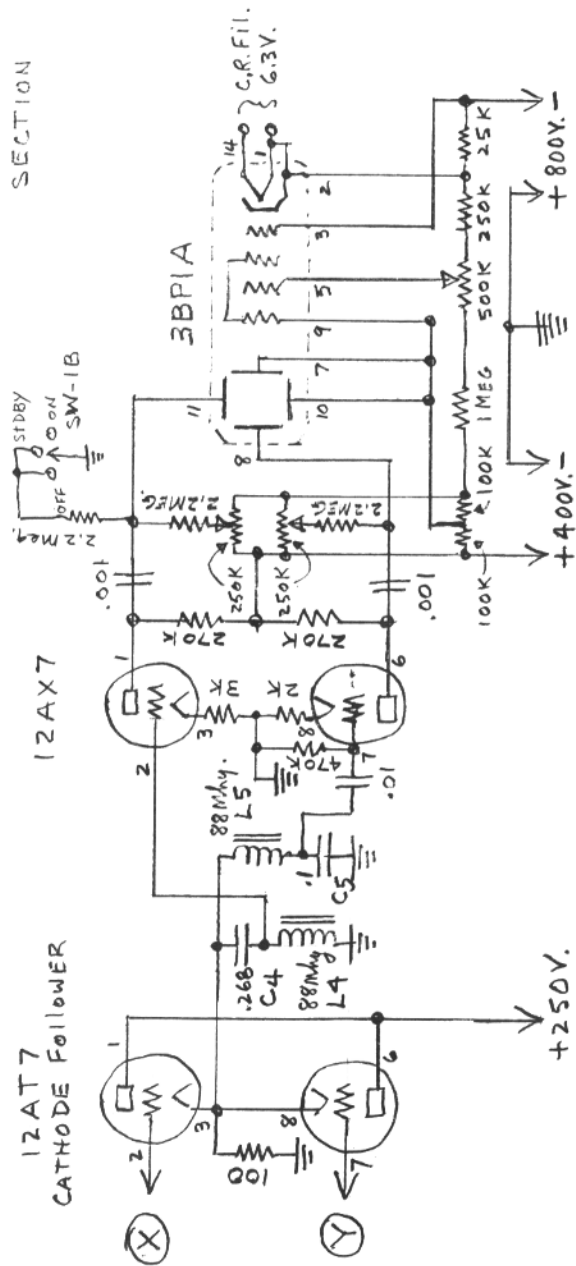
HETERODYNE T.U. AMPLIFIER-RECTIFIER SECTION 6/18/65



Note:

For optimum operation the input Volume Control should be retarded so that only moderate clipping is performed by limiters. Receiver AGC should be in "FAST" position, and should be depended upon to keep T.U. input reasonably constant. Individual AGC control of Mark and Space channels would probably give even better results.

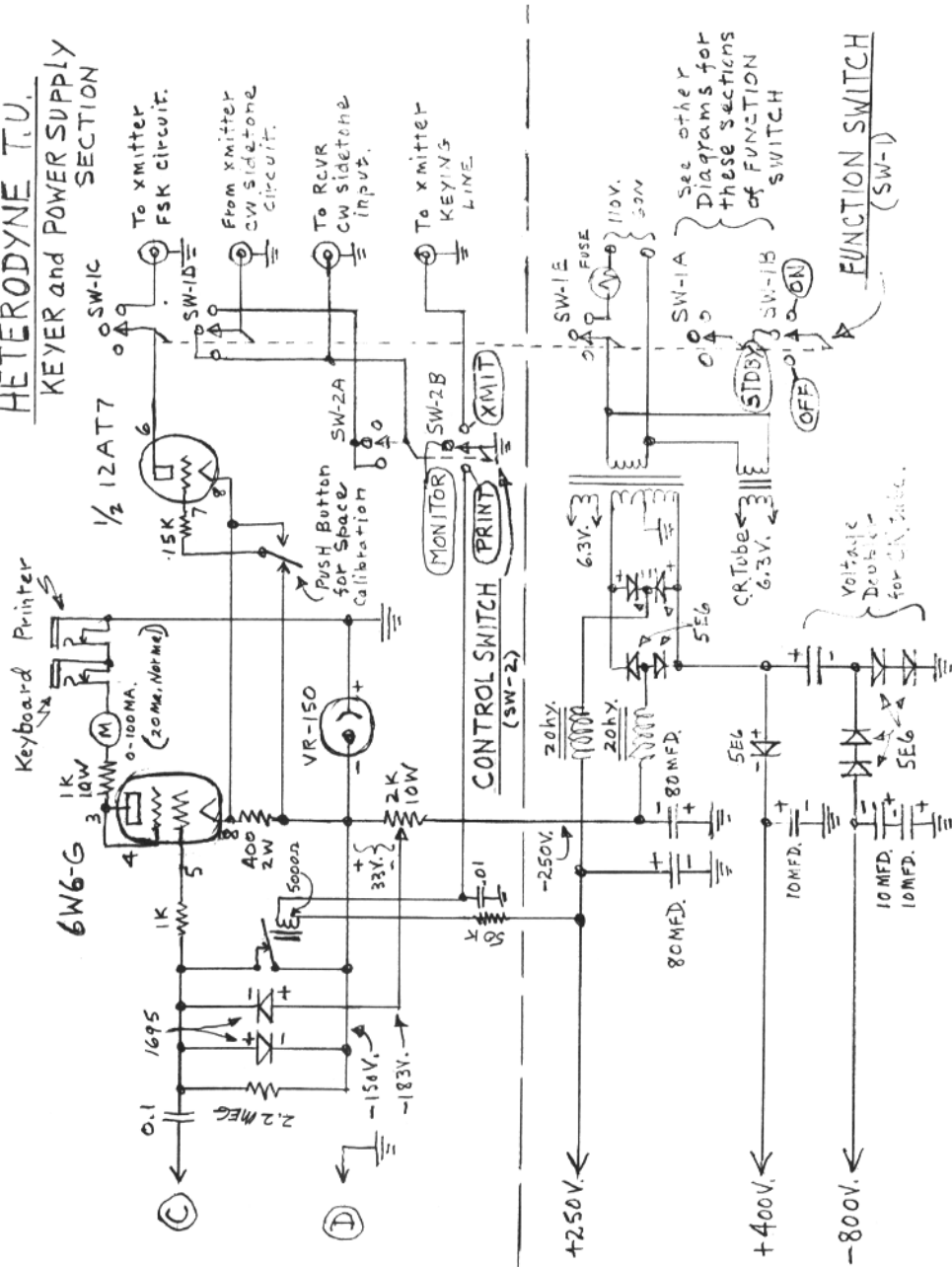
HETERODYNE T.U.
TUNING INDICATOR SECTION

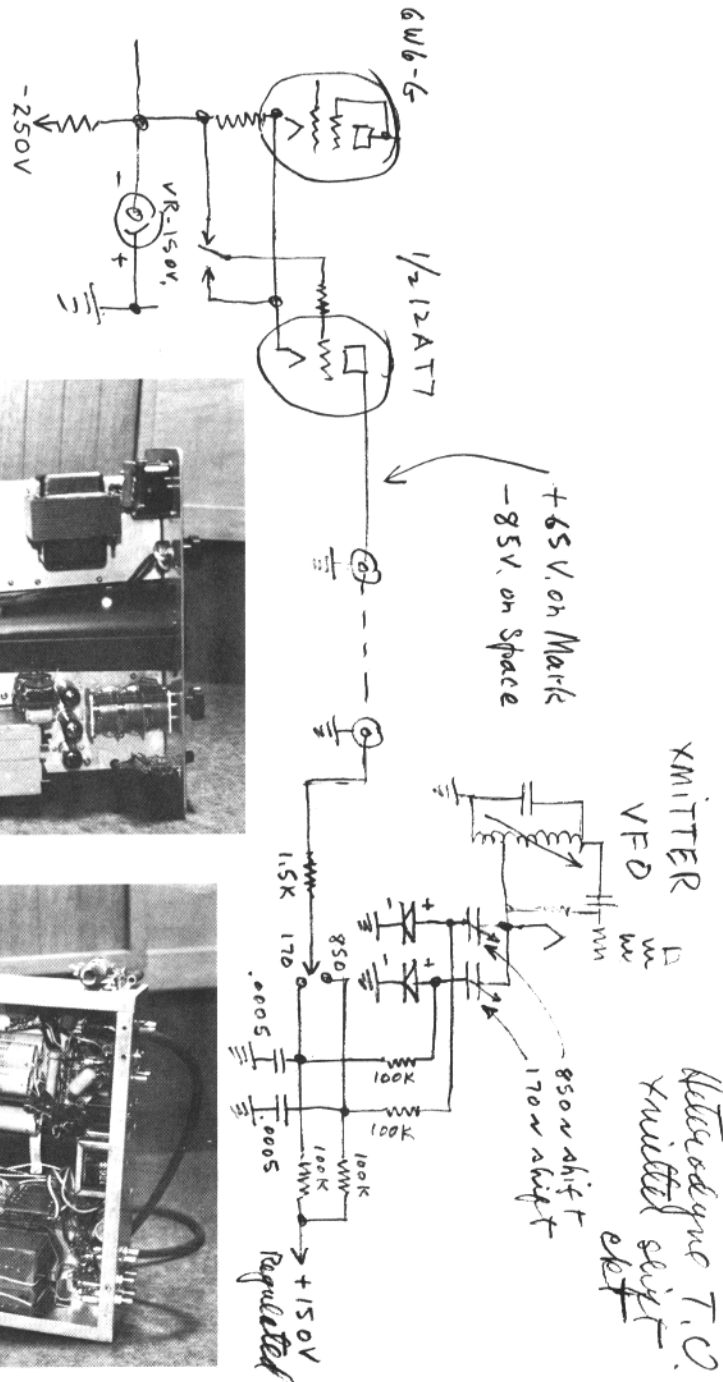
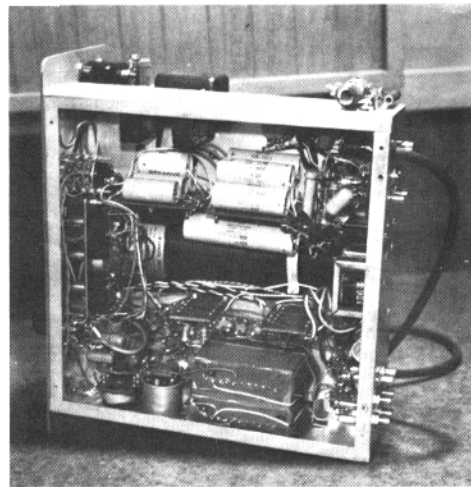
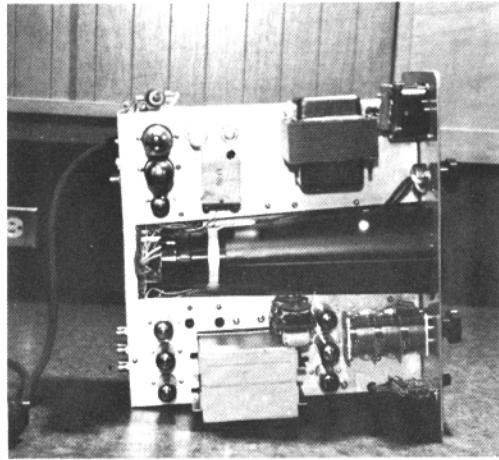


NOTES:

C4-L4 and C5-L5 must be tuned to exact centers of space and MARK filter pass bands. Silter # 1140 and 1860n respectively, by adjusting turns on coils. Cathode resistors of 12AX7 adjusted to compensate for sensitivity of vertical and horizontal C.R. plates.

HETERODYNE T.U.
KEYER and POWER SUPPLY SECTION





PRINTSET - BAUSATZ

DL6EQ

Stückliste

Alle Festwiderstände sind 1/2 Watt Typen.

4,7 MO	R20
2,2 MO	R33
1 MO	R29, R30
0,3 MO	R4, R11, R22, R23
0,22 MO	R21
0,2 MO	R1, R9, R10, R13, R14, R17, R19
160 KO	R5, R6
50 KO	R2, R3, R15, R18
20 KO	R25, R26, R27, R28, R31, R32
2,2 KO	R8, R16, R12, R24
600 O	R7
Potentiometer 0,4 Watt linear	
P1 - 1 MO, P2 - 100 KO, P3 - 5 KO	

Kondensatoren

20 MF	15 V	C4, C5, C7, C16
3,300 pF	125 V	C1, C2,
10,000 PF	400 V	C3, C6, C8, C9, C15
5,000 PF	125 V	C10
33,000 pF	125 V	C11, C12
0,22 MF	125 V	C13, C14

Röhren

T1, T2, T5 12AX7 oder ECC82
T3, T4 EL 84 oder 6BQ5

N 2 Glimmlampen NE 51 oder 110 Volt ohne Widerstand

2 NF-Schwingkreise für 2975 HZ und 2125 Hz.

Meßwerte

Anodenspannung 300 Volt bei mark 6 mA und space 4 mA. Linnenspannung 100 Volt

Gittervorspannung an Y - 300 Volt

An M3 min. 1 Volt negativ oder positiv

An Mitte von P3 Regelbar von 0-10 Volt (kann bis 50 Volt gehen)

Heizung 6,3 Volt und 2,42 Amp

Der Einbau der Bauteile

Bei N zwei Löcher aussägen nach dem Ø der Glimmlampen, dieselben einstecken und verlöten wie Skizze. Dann Drahtbrücke von

Mittelkontakt der Glimmlampe in keine Bohrung seitlich von N

Röhrensockel bei T1, T2, T3, T4, T5 wie anfangs beschrieben einlöten. (9 Stift Miniatur)

Dto. bei 2125 und 2975 Hz (7 Stift Miniatur)

Drahtbrücken bei B1, B2, B3, B4 einlöten.

Kondensatoren und Widerstände nach Stückliste einlöten.

Potentiometer P2 und P3 können direkt einbaupoten oder aber über Leitungen eingebaut werden (Achtung) diese Potentiometer werden nur einmal eingestellt.

Potentiometer P1 muß von der Frontplatte aus erreichbar sein, bei längerer Leitung zu diesem Poti die Leitung abgeschirmt verlegen.

Dioden einlöten auf Polarisation achten. Plus und Minus kann vertauscht werden (zwischen R25 und R26 sowie R30 und R29) aber nur alle vier nicht einzeln.

Der Fernschreibkonverter TU 5R6 dient zum Anschluß einer Fernschreibmaschine an einen Empfänger. Der Konverter ist für einen Linienstrom bis max 100 mA einstellbar, der Eingangswiderstand ist 600 Ohm wobei eine Eingangsspannung von 0,2 Volt benötigt wird um einwandfreies Schreiben zu erreichen.

Die Wirkungsweise des Converters ist folgende:

Die Eingangsspannung gelangt in den Vorverstärker, von dort in die beiden Selektivkreise S1 und S2 (S1- 2125 Hz. - S2- 2975 Hz.) danach folgt eine Selektiveverstärkung. Das Verstärkte Signal gelangt nun in den Slide back Dedector wo wahlweise space oder mark als positiver oder negativer Impuls umgewandelt wird. Nach durchlaufen eines RC Tiefpassfilters steuern die Impulse eine Triggerstufe, diese wiederum die Schaltstufe.

Die Röhrenbestückung ist folgende:

3 Stück ECC82 oder 12AX7

2 Stück EL 84 oder 6BQ5

5 Stück Dioden OAS1 oder 1N34

Der Linienstrom liegt bei max. 100 MA bei 100 Volt.

Das hervorragende Arbeiten des Converters TU 5R6 beruht auf dem Slideback dedector, dessen Arbeitsweise kurz zusammengefaßt folgende ist:

- 1) Ankommende Störungen (QRM) gehen durch beide Selektivverstärker geschwächt in den Slideback dedector und erscheinen zur gleichen Zeit als negativer und positiver Impulse, also heben sie sich vor der Triggerstufe auf.
- 2) Bei Ausfall eines Impulses, erzeugt der Slideback dedector, durch eingebaute Zeitkonstanten und gegengepoltter Gleichrichtung aus dem negativen Impuls mit einer Verzögerung von ca 150 mS einen positiven Impuls, und umgekehrt das gleiche. Ferner wird dies Impulsumsetzung zum einwandfreien steuern des Triggers herangezogen.

Der Aufbau von gedruckten Schaltungen.

Das Löten auf gedruckten Schaltungen erfolgt mit einem Kleinlötkolben von ca. 30 Watt mit gut verzinnter Spitze. Alle Widerstände und Kondensatoren werden von der mit Nummern gekennzeichneten Seite der Platte durchgesteckt und verlötet. Die Röhrensockel haben 10 Stifte bzw. 8 Stift zum anlöten dieser 10. bzw. 8. Stift ist dicker als die anderen, dieser Dicke Stift muß in das als Erde gekennzeichnete Loch.

Achtung die Leiterplatte ist entfettet und kann sofort ohne Vorbehandlung gelötet werden.

DX-RTTY

Edward S. Clammer, K3GIF,
5940 Avon Drive, Bethesda, Maryland 20014

ANKARA—

TA1AH came on the air on schedule June 11 and worked DL3IR for his first QSO. He also appeared on the air at 1900 GMT on June 12 and worked the following: DL3IR, FG7XT, K3GIF, W7VKO, DJ6ZBA, SM5KV, and G2HIO. Cecil, W7VKO, in Phoenix reported him as good copy. This operation will probably conclude TA1AH's activity for some time. If there is to be further action from this spot you will read of it here.

Jean, FG7XT, made his RTTY WAC with his QSO with TA1AH. Congratulations are in order for he has been fighting for an Asian contact for a long time.

Don, 5A5TR, Tripoli, made his RTTY WAC by a QSO with Freeman, KH6AX, arranged by Lou, 1IØRS. Don is leaving Tripoli in July for a post in California where he will be K4NIG/6. Don has certainly been the most active African station within the past year and we will miss 5A5TR and those call letters so difficult to type. Carl, 5A3TX, will remain for a while and we all hope he will be able to replace Don and keep Africa available.

ALGERIA—

Rene, DL3IR, reports the first RTTY QSO with 7Z3HT, whom many have copied but few have worked.

RUSSIAN Roulette—

The second Russian RTTY Station popped up on twenty meters recently in the form of UB5UN, Serge, who was promptly nabbed by 1IØRS and DL3IR.

UB5AC, Valentin, was worked by many Ws in the recent Volta contest. His signals are usually very strong on the East Coast.

FAROE ISLANDS—

Martin, OY7ML, has reappeared after about a year's absence with a good strong signal from The Faroes. Lou, 1IØRS, reports a good QSO with him. Martin uses 75 watts, dipole and a creed printer.

BARTG Contest—Official Results—

Pos.	Call Letters	Count	Wrkd.	Cont.	Score
1	FG7XT	19	5		45,030
2	KP4AXM	18	5		40,572
3	K8MYF	21	6		38,388
4	W2RUI	21	6		37,296
5	W3KDF	19	6		32,718
6	W3ZVJ	19	6		30,096
7	WØMPF	18	5		27,648
8	VE3BIJ	15	6		27,360
9	W1GKJ	16	6		26,368
10	VE3IR	14	6		22,260

ALEXANDER VOLTA—

Predicted winner—Sergio, 1IAHN. Runner-up: Ingemar, SM6CSC.

Serge reports a good deal of Multiband operation. He worked Europe on five bands, Africa, 5A5TR, on 40, 20, 15 and 10 and

North America on 80, 40, 20, and 15 meters. The QSO on 80 was with W2RNY, Tom.

The above information was elicited from "Newsletter" No. 32, published by BARTG and edited by Arthur, G2FUD. This is an excellent publication for the RTTY enthusiast. Items—

Ingemar, SM6CSC, reports from Goteborg that he has received the last QSL card he needed for his WAC-RTTY. He also states that thirty Creed and Siemens machines have been distributed to Swedish hams. So look for much more activity from that area.

Bud, W6CG, is back on the bands again. He opened up with QSOs with KH6AX, 5A5TR, DL3IR and 1IØRS. Not a bad second beginning. Bud is getting a new beam and rotator and will be on in full force later in the Summer. Bud reports working DJ8NT, Horst, for his first DX QSO.

Phil, W2JAV, writes that he has been on the sick list for a considerable time. Phil is a pioneer RTTY man and the designer of much of the gear now used in RTTY. We wish him a complete and speedy recovery.

Sandy, KP4AXM, put up a fine battle in the BARTG Contest but lost out to Jean, FG7XT. The main reason for this was that Jean worked Rafael, YV5AVW for South America and Sandy missed him. This is pure tough luck and we wish Sandy a better break next time.

Zip, OA4BR, has been quite active from Lima, Peru. He operates mainly on twenty meters during the early evening hours and weekends.

Twenty-One Gun Salutes—

First—to Herb for putting TA1AH back on the air. Second—for those fellows who worked him during the short period he was on the air for not fouling up the band for the others. Of those who called him in the fifteen minutes of operation on Saturday, I think only one, W8CQ, missed him. Third—to Don, 5A5TR, for a great job of RTTY operating during the past four years from Tripoli.

Band Conditions—

Reception of European stations by those East of the Mississippi is generally best late in the afternoon. There are some early morning openings to Europe but their duration is usually short.

Conditions to South Africa are very bad at this time and are expected to remain so until mid-Autumn. South America comes thru best about dusk in the East while Oceania and Australia from 0300 to 0600 GMT.

With this issue your substitute editor will again turn the keys back to Bud, W6CG. Meanwhile, the new TA-36 and its Ham-M rotator will be going up to the sixty foot level. So—lookout! DX.



HORSE TRADES

FOR SALE: 6146B, \$4.75; 6CW4, \$1.40; 417A, \$3.95; 826, \$6.90. BRAND NEW, Boxed, no pulls, seconds or JAN. Send for catalog listing hundreds of other types at equal savings. VANBAR DIST. P.O. BOX 444R, Stirling, N.J. 07980

WANTED: Table for Model 15 printer. VE3GU, 41 St. Leonard's Crescent, Toronto 12, Ontario, Canada

FOR SALE: Surplus filters, mfg'd for Collins Radio. Type numbers 673-XXXX-00 similar to those described in September 1964 RTTY. Band pass width at 3 DB points 100 cps. Some have a discriminator circuit in addition to the Band-Pass filter, while others have an oscillator coil/capacitor. Frequencies are: 595-765-1105 - 1445 - 1785 - 1955-2465-2805-3145-3315 cps. Quantities are limited. Also a similar 100 cps band pass in an approx. 3"x3" square case. 5-1/16" high with an 11-prong plug on bottom. 1105 - 1380 - 1620-1740-1860-1980-2460-2580-2820. Still a few 70 cps Band Pass, similar to first group (larger case) 1380-1620-2820 cps. Price is \$2.50 each plus postage. Excellent for Hetrodyne TU. Since we have limited number of each, they will be supplied as long as supply lasts, and afterwards, funds returned. RTTY, INC., 372 Warren Way, Arcadia, Calif. 91007

FOR SALE: Model 14 Keyboard perforator with table and power supply, end of line indicator/counter. \$35.00 plus crating and shipping costs. RTTY, INC.

FOR SALE: W6NRM TU per original article with 850 cycle filters. Built into slide out CV case, pictured on cover of CQ September 1964. \$85.00 or will swap for 2 meter Communicator II. W2H-WH, 12 Maplewood Avenue, Maplewood, N.J.

FOR SALE: CV-89A, \$175.00. Also new scope tuning unit with all tubes from CV89A, \$30.00. BC-458 VFO with FSK, \$18.00. Boehme repeater amplifier AM-103821, new-unused \$35.00. W3-LST, 228 Plummer Street, Oil City, Pa. 16301

WANTED: CV-71/URR Converter. Robert Ledbetter, P.O. Box 12470, Oklahoma City, Oklahoma 73112

FOR SALE: Model 19 set, complete, \$125.00; Polar relay Test Sets (1-193) see April '65 RTTY. \$12.95. Brand new 5" rolls page paper, 12 rolls case/\$8.00. Frequency Shift Keyer FSA, \$39.00. Loop supplies, M15 type, \$6.00. M19 type, \$10.00. All units are in working order. Fob, W2BVE, 834 Palmer Avenue, Maywood, N.J. 07607

FOR SALE: Brand new Model 14 typing reperf., \$85.00. Brand new Model 14 TD, \$65.00. Also model 15 with auto CR/LF, \$100.00. Will ship both 14's. K0GXL, 5732 Ovid Avenue, Des Moines, Iowa 50310

FOR SALE: Model 14 TD's, \$45.00. W7YHS, 319 North 26th Street, Billings, Montana 59101 (Also several WE 255A relays)

FOR SALE: Altronics Terminal Unit, new, CRT tuning. Perfect. Any reasonable offer. Claude Sweger, W0BTV/5, P.O. Box 192, Alamo, Texas

FOR SALE: 88mhy toroids, five for \$1.50. TD's unchecked, \$25.00; checked, \$45.00. Reperf., less cover, \$35.00. MXD-3 headed TDs, \$65.00. 11/16" tape, 10 rolls, \$2.50. Model 14 strip printer, with keyboard, less motor, \$19.95. WU TDs with sync motor, good working cond., \$22.50. J.J. Glass Electronics, 1624 S. Main, Los Angeles, Calif.

FOR SALE: Model 15, sync motor, 60wpm, \$70.00. AFSK test tapes on magnetic tape, \$2.00. Paper punched test tape, \$1.00 postpaid. K5B QA, 11040 Creekmere, Dallas, Texas 75218

FOR SALE: Large 31 x 16 schematic diagram of Mainliner TT/L. All latest modifications are included in this drawing, \$1.00 Postpaid. W8SDZ, 4626 Rambo Lane, Toledo, Ohio 43623. Also Sell or Trade: Kleinschmidt TT-100. Excellent condition. Make offer, want Collins receiver R-390A, 75A4, or 75S1.

WANTED: Model 28 ASR cabinet complete, or incomplete. Will pay top price. Also, model 28 LXD units (tape reader and distributor). I only want the TD and not the base, gears or motor. This is the tape reader used on the ASR set and the 28TD. Jerry Murphy, 2547-18th Avenue, San Francisco, Calif. 94116

FOR SALE: One new 276B Mercury Relay, works in TT-63A/FGC repeater, \$3.00 pp. One 255 polar relay and socket, \$3.00 pp. W1KAY, 2 Punch Bowl Dr., Westport, Conn.

FOR SALE: Aluminum 20/60 ma Model 15, Model 14 typing reperf and TDs. All machines complete and all set to go. Kleinschmidt Model 150 like new, \$200.00. K6PZT, 9337 Gotham Street, Downey, Calif. Phone: T0paz 9-3292.

SWAP: Will swap any of the following items for a Model 14 reperf and TD. NAVY TDE Xmtr in good condition; ATK Television camera in good working condition; Johnson Viking 2 in good condition. W6RRZ, 6612 Humboldt, Westminster, Calif. 92683

FOR SALE: Model 28KSR console type, like new, \$325.00. Model 15 excellent condition, \$85.00. Crating and shipping additional. W9ECC, 851 Crestview Drive, West Bend, Wisconsin

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