

20 September 1970

DX cont.-

Continued from page culties are understandably great but with some help from the boys in Europe he hopes that this will be possible in the near future.

A note from Mac, W4YG, tells us that Dave, HC1MF, is now back in the States and that anyone needing a QSL for RTTY contacts with HC1MF can drop a card to --

Dave Mitchell
9767 GoodLuck Road
Seabrook, Md, 20801

In a QSO just before we sent to press, Venkat, VU2KV, told us that he would be in the States in September and if possible would like to see some of the fellows he has met via RTTY over the past few years. He will be in the Detroit area and also in the Washington - Baltimore area. Plans are still tentative at this time but Dusty is expecting a letter with more details. Anyone interested should get in touch with either Dusty or myself and we will try to pass along more complete details of Ven's trip as we receive them. This is fairly short notice and further details will not be possible via these pages.

The BIG C A R T G Contest is getting closer and full details appear in this issue.

RTTY JOURNAL

We have had a preview of the Awards via photo and believe me, they are bigger, better, and more of them than ever this year. Go over your gear NOW and get it in top shape for the "Big Smoke", as Sid, VE3GK, helmsman of the CARTG calls it. It's later than you think.

73 de John

C31BT got on 14 meg; August 7.

VHF News--

Continued from page 13

"I doubt if you are aware of VHF RTTY activity here in Arizona. We have a minimum of 25 fellows available to handle traffic on RTTY on the VHF MARS frequencies. There are about 10 stations who are quite active. We utilize a repeater on Mt. Lemmon (near Tucson) and are able to cover about 50% of the state. This activity has existed since 1956. The usual ups and downs in participation have occurred during this period."

Thanks to all for the information. We would like to have at least this much VHF information each month, but you have to supply it.

73 ES CUL, RG.

RTTY JOURNAL

September 1970

EXCLUSIVELY AMATEUR RADIO TELETYPE

VOLUME 18 Number 8

30 Cents

ST-6 Solid State Mainline DEMODULATOR

by Irvin M. Hoff, W6FFC

STARTING PAGE 5



'JO' CR6CA

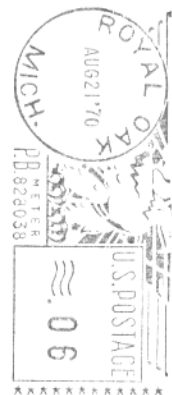


'Pierre' FY7YQ

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First Class Mail --



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P O Box 837
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C.A.R.T.G. 10th RTTY DX SWEEPSTAKES

October 16-18 1970

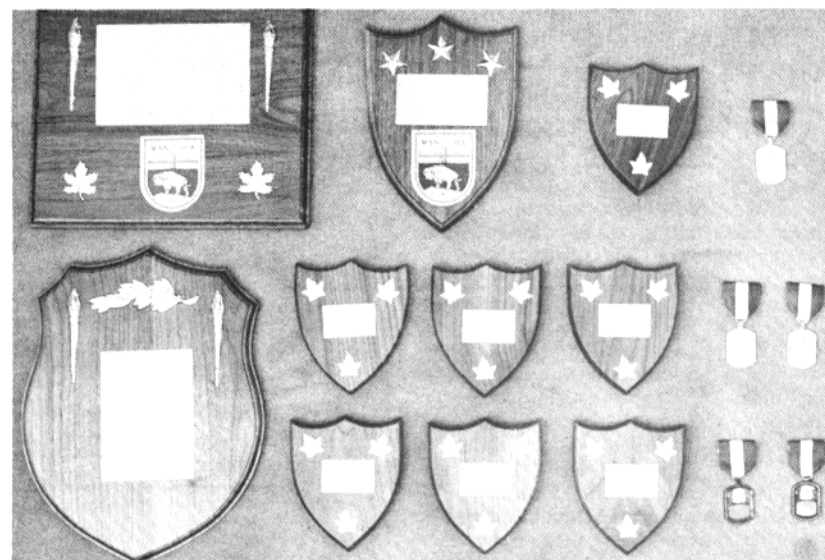
Sid Burnette and his CARTG crew have again come up with plans for another DX Sweepstakes contest that promises to equal or better the past "best ever" contests sponsored by the CARTG.

As in the past few years beautiful plaques and medals will be awarded to a large variety of winners and high scorers. In honor of the centennial of Manitoba special points will be awarded for working any VE or VO contacts. A large number of other awards including one for the high score of anyone never before participating in a DX contest are available. See below.

We certainly hope that as many DX stations as possible will try to be on at least part time during this contest. Printed logs are available (See rules below). As a

further service to DX stations fearing a deluge of QSL problems the CARTG and The RTTY Journal will be happy to handle any requests without charge if the log turned in from the contest is so authorized. The zone chart has been printed in several issues of the Journal and in CQ and QST magazine but a copy will be sent to anyone not having access to one. It is not necessary for operation in the contest but needed to compile your score. The zone used in your message is your zone according to the CQ magazine zone chart. If you are in doubt most entries in the contest will be happy to help you determine it.

Mark your calendar now and let's make this a record breaking contest.



Photograph by Robert Hudyma

1. CONTEST DATES

Commencing at 0200 GMT Saturday October 17 and ending at 0200 GMT Monday, October 19, 1970

Total Contest Period is 48 hours but no more than 36 hours of operation is permitted. Time spent in listening counts as operating time. The 12 hour non-operating period can be taken at any time during the test but times on and off must be summarized on the log and Score Sheets.

2. BANDS

The Contest will be conducted on 3.5, 7, 14, 21 and 28 MHz amateur bands.

3. COUNTRY STATUS

ARRL Country List - except KL7, KH6 and VO to be considered as separate countries.

4. MESSAGES

Message to consist of:

- Message number, Time GMT.
- Zone and Country.

5. EXCHANGE POINTS

(a) All two-way contacts with stations in one's own zone will receive 2 points.

(b) All two-way contacts with stations outside one's own zone will receive points listed in the Zone Chart. (Same chart as used in last year's test)

(c) Stations may not be contacted more than once on any one band. Additional contacts may be made with the same station if different band used for each contact.

6. In Honor of Manitoba Centennial

Bonus of 100 Exchange Points added for

every VE and VO station contacted. Bonus points to be added to total score.

7. MULTIPLIERS

A multiplier of one is given for each country worked including one's own on each band. e.g. If one country worked on 3 bands, then 3 multipliers given.

8. LOG SHEETS

Separate page for each band. "CARTG" Log Sheets available on receipt of SAE or IRC's. Logs must contain: Band, Number exchange, Times sent & Received GMT, Station Calls, Zones, Countries, Scores, Exchange Points, Power Input, Rest Periods.

Logs must be received not later than December 1st, 1970. Send Logs to:

9. SCORING

Total number of Exchange Points multiplied by number of Countries worked, multiplied by number of Continents (maximum 6). Finally "Manitoba Centennial" Bonus Points are added to total score.

Scoring Example

Exchange Points.	(2020)
Countries	
3.5 Mhz. - 5	
7 " - 4	
14 " - 18	
21 " - 10	
28 " - 3	
TOTAL - 40	
Continents.	(5)
Score - 2020 x 40 x 5 equals	404,000 Pts.
Bonus Points added -- 300	
TOTAL 404,300 Pts.	

List of Contest Awards

- Plaque - Manitoba "CARTG" Members
- Plaque - "RTTY JOURNAL"
- Plaque - Manitoba "CARTG" Members
- Plaque - Manitoba "CARTG" Members
- Plaque - "RTTY JOURNAL"
- Plaque - Manitoba "CARTG" Members
- Plaque - "RTTY JOURNAL"
- Plaque - Manitoba "CARTG" Members
- Plaque - Manitoba "CARTG" Members
- Plaque - Manitoba "CARTG" Members
- Plaque - "RTTY JOURNAL"
- High Score U.S.A. - Gold Medallion & Ribbon - "RTTY JOURNAL".
- Canadian High Score. Gold Medallion & Ribbon - Canadian Director's Award
- "Green RTTYer" High Score - (Never participated in any RTTY Contest) Bronze Medallion & Ribbon "RTTY JOURNAL"
- 10 Meter High Score. Silver Medallion & Ribbon - "RTTY JOURNAL"
- High Score for Low Power Stations (under 100 w. input). Bronze Medallion & Ribbon - Manitoba "CARTG" Members
- Certificates for two top scores in each U.S.A. and Canadian District, and in each Country.

*** **

BARTG 1970 Contest Results-

No.	Call sign	Points	14 WA6WGL	81540	28 LA6OI	39370	41 AX3DM	18756
1	I1KG	177800	15 W1JKL	81200	29 DM2BRN	38940	42 WA8GVK	18600
2	ON4CK	167118	16 SM4CNN	76152	30 OZ4FF	37990	43 G3OWM	15200
3	SM4CMG	156860	17 I1CWX	75816	31 EI4AL	37128	44 VE3RTT	14550
4	VK2FZ	135072	18 I1EVK	73500	32 W1BZT	34860	45 AM2ALW	12768
5	G3MWI	123480	19 DL1VR	72734	33 I1LCL	33318	46 K9BJM	10944
6	VE7UBC	109912	20 EL2BD	71280	34 EI5BH	32900	47 ON5WG	8856
7	W4YG	105164	21 F9RC	63700	35 WB2JBH	32292	48 OZ6OB	8580
8	I1CAQ	91556	22 DL8VX	52700	36 DJ8BT	29700	49 WA2CGR	7104
9	SV0WO	91520	23 WB6RXM	49600	37 W6AEE	29568	50 OK1MP	4920
10	I1CGE	91224	24 WA2YVK	49104	38 GB2SM	26268	51 K4GJW	4774
11	KG6NAA	91180	25 PA0GKO	47128	39 JA1ACB	25460	52 W8CTO	2260
12	K8ILL	90418	26 SM0KV	46748	40 ON4BX	23800	53 ZD9BN	840
13	W5QCH	88690	27 VE3GSZ	45600				

'MITES' In The Ham Shack--

Richard Bourgeois, W5EVH
P.O. Box 2746
Lafayette, La. 70501

Despite the fact that an increasingly large number of MITE Corporation teleprinters are finding their way into the hands of amateurs, the number of published articles on these machines remains very low. Use of MITE machinery is complicated by the rarity of technical manuals, information and parts. It is hoped that this article will spur interest in the use of more MITE machines on the air and increase the circulation of information on these machines through ham circles.

The first problem a MITE owner encounters is hooking his machine up to his station loop supply. Without a schematic, this is a formidable task. However, the procedure which follows should put any machine on the air properly and easily.

Remove the printer from its case. On the rear of the machine just under the paper roll are seven numbered jacks, probably with jumpers in them. Patch the jacks as follows:

- Patch with jumpers
 - jack 3 to jack 4,
 - jack 6 to jack 7,
 - jack 2 to jack 1.

This places the keyboard in series with the selector mechanism and sets up the wiring for an external loop current supply.

On the right rear of the machine is a 12-pin jack into which plugs an Amphenol type 165-10 connector. Wire this connector as follows:

Continued on page 17

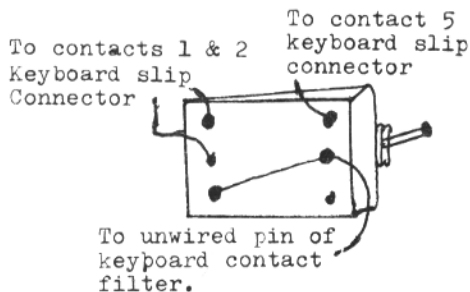


Figure 3 - Pictorial wiring diagram of send-receive switch for MITE modification (see text).

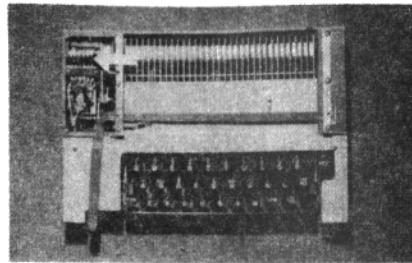


Figure 1 Top View of keyboard, removed from printer. Arrow shows 6-contact keyboard slip connector.

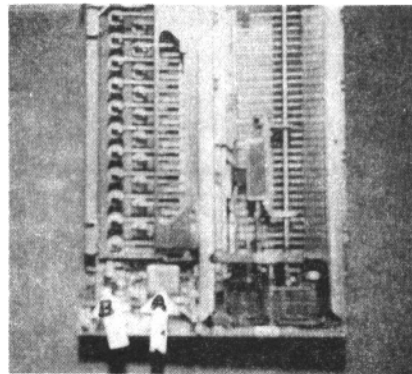


Figure 2 Bottom view of keyboard, typing key guard plate removed. A - keyboard contact filter. B - break switch.

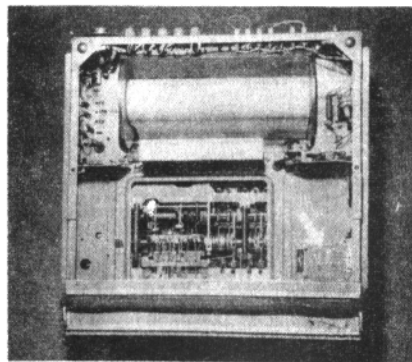


Figure 4 Bottom view of printer, cover removed. Arrow shows location of keyboard connector contact strip.

Mainline ⊕ Solid State ST-6 DEMODULATOR

IRVIN M. HOFF, W6FFC
12130 Foothill Lane
Los Altos Hills, Calif. 94022

INTRODUCTION

The Mainline ST-6 RTTY Demodulator is similar in design and layout to the Mainline TT/L-2 (Sept. 1967 RTTY JOURNAL; May 1968 QST.) It is all solid-state, using a number of 709C operational amplifiers in addition to other transistor devices. The Mainline TT/L-2 was an upgraded Mainline TT/L (Nov. 1964 RTTY; Aug. 1965 QST). These tube-type RTTY demodulators have been extremely popular with serious RTTY enthusiasts. The ST-6 follows in this great tradition.

FEATURES

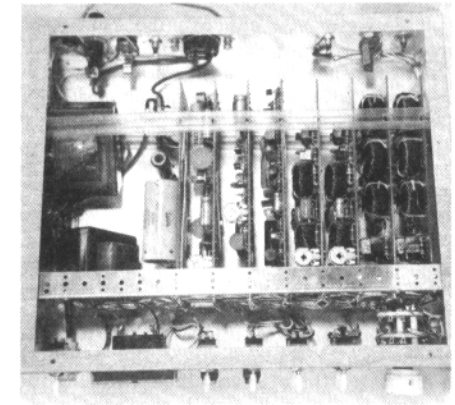
The ST-6 has an outstanding limiter, a well-designed linear discriminator, full-wave detection, a 3-pole active low-pass Butterworth filter, a threshold corrector allowing limiterless ("AM") copy, a high-gain slicer permitting extremely narrow shift signals to be copied normally, a 300-volt loop keyer transistor, the well-known "Mainline floating loop" offering optimum FSK keying of the transmitter, and a 180 volt loop supply.

In addition, optional bandpass input filters for 850 and 170 shift are provided, automatic printer control with motor delay ("autostart") that ignores voice or c.w., an "anti-space" system that immediately locks up the printer if the signal goes to space longer than a normal RTTY character, simplified switching that provides good flexibility, and a symmetrical plus-minus 12 volt power supply that is adequately regulated. The unit has a limiter on-off switch, a fast-slow autostart switch for rapid break-in, a manual motor "on" switch, a meter for tuning signals, remote standby provisions, etc.

OTHER "ST--" UNITS

To keep the record straight, the ST-1 was never published. The ST-2 was a nice unit for VHF without autostart motor delay. The ST-3 (RTTY JOURNAL Sept. 1968; QST April 1970) was the same unit having motor delay control in addition to autostart. The ST-5 was a simple unit using two op amps and one 300-volt keyer

stage (RTTY JOURNAL May 1970; HAM RADIO Sept. 1970) and no autostart features, being intended for the beginner who needs a simple, easy-to-build unit. The ST-4 was only for 170 shift.



Top; View of authors ST-6

Bottom view of ST-6 showing placement of PC boards; Power supply at left.

THE 709C OPERATIONAL AMPLIFIER

This unit is the "work-horse" of operational amplifiers. The cost has dropped to the point they are very inexpensive even in small quantities of only 1 or more. They have in excess of 90 dB. gain when used in "open loop", and are good to 10 MHz. as well. They can take as much as plus-minus 18 volts, although it is customary to use them at plus-minus 12 volts. They have very low offset input voltage which can be easily balanced. As they cascade numerous differential amplifiers for high-gain, they clip symmetrically, making an excellent limiter or

voltage comparator, as well as a good linear amplifier when controlled feedback is added.

They do, however, require frequency compensation to be added externally, the amount depending upon the gain to which the circuit is expected to amplify.

OTHER, NEWER, OPERATIONAL AMPLIFIERS

To be sure, there are never op amps having higher gain, will accept greater input voltages without damage, are not subjected to "lock up" with excessive input voltages, and do not require external compensation. However, these units are intended primarily for use in logic circuits where very low frequencies (almost "d.c.") are used. These units make very poor limiters when compared at audio frequencies with the 709C. They would be excellent for use in the ST-6 at places other than OA-1 and OA-2. However their cost is such you can use the 709C with proper compensation and still save money. The difference in amplification between 90 dB. and 100 dB. is insignificant in this case, since even 90 dB. would be the equivalent of running the TT/L-2 (tube-type demodulator) at perhaps 7500 volts on the plate of each tube. So do not feel the 709C is obsolete in any way for our purposes.

THE LIMITER

The input is designed so that a band-pass input filter is not required. A simple single-section L/C high-pass filter reduces the 60 Hz. output of the receiver to an insignificant level, thus allowing the limiter to "reach into" the receiver's noise level for the signal. Zener diodes are provided to protect the input of the amp from possible overload. They are not intended as part of the limiting action at all, and normally are not called upon to do a thing. The op amp itself is run at full "open loop" for limiting. A signal as small as 200 microvolts will produce clipping, and the output waveform with normal input signals is "story-book" square waveform with amplitudes approaching that of the supply voltage itself.

A 47K resistor is provided for changing the amplification to a controlled amount, for "limiterless AM" detection should the operator choose to use this system. Since limiterless operation and autostart are not compatible in this type of circuitry, placing the switch to "limiter off" also disables the autostart, and keeps the motor running automatically.

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THE BANDPASS-INPUT FILTER(S)

Three-pole Butterworth bandpass filters are offered for the serious enthusiast. These are 3 toroids each. The 850 shift bandpass filter is about 1 kHz. wide and the toroids are used in series configuration for 88 mH. For 170 shift, they are wired in parallel (both outside wires together, both "pig tails" together) for 22 mH. This keeps the impedances similar for the two units. The bandwidth of the 170 shift filter is about 275 Hz. These filters are based on 2125 mark tone. No filters are offered for those requiring other, unusual audio tones. If the bandpass input filters are used, the 0.022 mfd. capacitor and the 10K resistor to ground (pin 2 or OA-1) are not used.

THE LINEAR DISCRIMINATOR

Optimum filters for mark and space channels would probably be 3-pole Butterworth types using 3 toroids for each filter. However, excellent results are obtained from a well-designed linear discriminator using only one toroid for each channel. A great deal of attention must be given with such a simple set of filters to achieve good noise immunity, good zero crossover, equal bandwidth and equal output voltages. This is not simple, particularly when in addition you would like to get both 170 and 850 shift filters to give similar output voltages. The filters in the ST-6 should meet these requirements nicely, if the exact values of components are used. The size of the capacitors are only approximate, as the toroids themselves have 2-3% latitude and the capacitors will probably be only 10% types as well. This could easily result in an error of 100 Hz. and more, so careful attention to tuning each toroid is most worthwhile.

A "plus-plus line" is added to the discriminator to provide a signal for the autostart system as well as to the tuning meter.

THE DETECTORS

Full-wave detection is employed for easiest filtering of the ripple content. The ST-- series units are unique in this feature. Germanium diodes are used, as their forward voltage drop is only 0.2 volts or less, as compared with about 0.7 volts for a typical Silicon diode. This gives some additional dynamic range to this section. As the Germanium types do not have high reverse resistance, they can only be used in relatively low impedance areas.

RTTY JOURNAL

You will notice no actual filtering is done in the detector circuit itself, another unique feature of the ST-6. All the filtering is done in the 3-pole active low-pass filter, thus extremely rapid recovery time is possible from things such as noise bursts, static impulses, etc.

THE LOW PASS FILTER

The Mainline ST-6 is probably the first RTTY DEMODULATOR to be offered the amateur using an optimum bandwidth 3-pole Butterworth low pass filter of an "active" design, that is, with feedback amplifiers rather than with inductors or other "passive" components normally used. This offers low cost, small size, controlled performance, negligible weight, and results that can be easily duplicated from one unit to the other with modest-cost components. (The inductor used in the TT/L low-pass filter had extremely sloppy tolerances of about plus 50%, plus additional problems such as magnetic hum, large size, etc.)

The low-pass filter was designed for optimum 60 speed use. It can easily be changed (via two resistors and a capacitor) to 100 speed if needed. It cuts off at 27.3 Hz. d.c. for a steady mark input, having a ripple content too low to measure on the Tektronix scope at our disposal.

THE THRESHOLD CORRECTOR

For limiterless AM copy, some means of balancing the mark-space signals from the low-pass filter is required in order that the slicer can properly change at the right time. The ST-6 thus has an automatic threshold corrector, called the "ATC" for short. Again, Germanium diodes are used to give the maximum possible dynamic range. This circuit was explained in some detail in previous articles by the author (RTTY Nov. 1964, reprinted March and April RTTY JOURNAL 1970). It allows single-channel copy and combines the mark-space signals for symmetrical operation around the ground axis of the slicer.

THE SLICER

This is just a "wide open" 709C. Other op amps would work as well in this position since the signals handled are very low frequency (maximum of 22 ms. reversals for 60 speed). The slicer has so much gain and the signal from the low-pass filter is so clean that shifts as low as only 1 Hz. will adequately flip the slicer from full mark to full space output. This with the 850 shift discriminator as well! This

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is rather silly, in fact, but adequately illustrates the terrific potential of the op amps used in the ST-6.

THE KEYSER

This is a Motorola MJE-340 rated at 25 Watts and 300 volts. Other types are equally suitable, if rated from 300 or more volts. A spike-absorbing network is used on the collector to prevent damage from the back-emf developed in the selector magnets when several units are added in series to the unit, such as a reperf and printer combination, etc. The emitter is grounded and the base is held to a maximum of -0.7 volts by a protective diode. Positive voltage is used to saturate the transistor on mark, and negative voltage it used to assure it cutting completely off (rapidly) for space. This results in little or no bias.

THE LOOP SUPPLY

This uses the well-known "Mainline floating loop" system the author developed for the original TT/L. This method gives the usual 180 volts or so to the keying stage for low distortion, but the principle feature is the plus-minus keying voltages for the FSK system in the transmitter. This not only gives saturated diode current for best FSK operation, but controlled cut-off voltage for back-biasing the FSK diode properly. With this type of FSK voltage you only need to reverse the direction of the diode to get "right-side up" operation if you are reported to be transmitting "upside-down" from normal. Few other systems (if indeed any other), offer such a simple solution to this type of problem.

This type of system also offers simple and effective means of providing narrow shift c.w. identification.

THE POWER SUPPLY

This uses transistor-stabilized, Zener-regulated plus and minus 12V. Again, full-wave rectification is used for easiest filtering. The output is by-passed for r.f.

FUSES

An unique feature of the ST-6 is the liberal use of fused protection. This provides protection against dead shorts in the power (and loop) supply. Thus 24-hour unattended operation should not alarm the user. With every other item of electronic equipment with which the author is familiar, only the primary of transformers have been fused. In some instances partial shorts have caused sig-

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nificant damage, even minor fires, and yet the fuse did not blow. This has always been of deep concern since I leave quite a few units running even when I am on the other side of the USA for a few days. I have put fuses in the secondary of all my transmitters, and most of the receivers.

THE ANTI-SPACE CIRCUIT

The maximum time an RTTY signal can go to space is for a "blank" key. Other than this, for a "T". The blank has all space information except for the stop pulse, the "T" has all space information except for the last information bit plus the stop pulse. For a blank, this maximum time would be 132 milliseconds, for a "T" it would be 110 milliseconds. Thus if we had a means of determining when the space signal exceeded say 132 ms. it would indicate the signal was not an authentic RTTY character.

The anti-space circuit samples all space information, and when it substantially exceeds 132 ms. it says "tilt" and puts the printer back to markhold, at the same time placing the autostart circuit to a "no signal" condition. As soon as the space signal stops and the first mark information is fed out of the slicer, the unit is discharged almost instantly and normal operation again results. Consequently with normal RTTY, steady blanks will not operate the anti-space, but anything longer will place the printer into standby. Space signals thus will not trigger the autostart. This circuit works equally well with the autostart on or off, or with the limiter on or off, or with "straddled-tuned copy".

THE AUTOSTART SYSTEM

This system is based on a concept described previously in the TT/L, TT/L-2, and ST-3 articles. However there are always some readers who are not familiar with previous discussions, so here goes a simplified explanation.

Morse code is perhaps less than 50% "duty time" (key down). Voice is perhaps 20-30% duty time, depending on things like voice pattern, compressors, intelligence of the operator to keep the audio gain at a proper level, etc.

RTTY on the other hand is actually 100% duty time. Thus we develop a method by which a high-duty time will trip a circuit and a low-duty time will not, it should respond only to RTTY. Thus the autostart in the ST-6 (like the others

mentioned a moment ago) samples both the mark and space channels and combines their output as a one-polarity voltage. As long as this voltage is substantially greater than the trigger point for which the system is adjusted, it will charge a capacitor. If it charges this system long enough, it will then overcome a fixed bias and turn on a relay that starts the motor and at the same time remove a "hold" on the printer magnets allowing it to respond to the incoming signal.

A network is provided to quickly discharge the capacitor in the event the signal stops, putting the printer into standby, and starting the "count-down" on the motor relay. If after 20-30 seconds the signal has not reappeared, the motor is allowed to turn off.

A turn-on to turn-off ratio on the autostart of 4:1 provides about a 75% duty-time requirement to turn on the printer. Since static, fading, momentary interruptions, etc. affect the RTTY signal, around 70-75% duty time seems to give excellent results, and suitable immunity to nearly all c.w. signals.

By keeping the "turn-off" time about one second (5-6 characters time), adequate protection against static, noise crashes, etc. is provided. This requires a turn-on time of about 3-4 seconds. Thus some information will be lost if the person at the other end is not aware that it will take 3-4 seconds to turn on your unit. However, this is only a small penalty to pay to achieve automatic printer control. It is also possible to have a "fast" autostart system which operates about 3-4 times faster than this. However poor conditions will give adverse results, so this system is used normally only when the operator is present and working "quick break", etc.

Other ratios may be used, and will in fact keep the ST-6 from responding at all to weak signals that would probably not be copied reliably anyway. A table of such values shall be included if you wish to try various combinations. The disadvantage with higher ratios is the longer turn-on times needed.

THE REMOTE STANDBY LINE

A remote standby jack is provided on the ST-6. When shorted to ground, it places the unit in standby and also turns off the autostart, turning the motor on or keeping it on if it had been already running. This allows you to monitor the incoming signal from the receiver while trans-

mitting, but keeps the printer from responding at all, except from its own keyboard. It also keeps the motor running during the time you are on the air. On the other hand, if this remote switch is located at the printer, it allows you to turn the printer on without touching the ST-6 itself. By shorting out the autostart, you pick up an additional benefit, when you stop transmitting and the remote standby switch is opened, you can instantly respond to a station "tail-ending" you to break in -- with normal autostart on other units, it would take several seconds before you could respond, unless you had moved to "fast" autostart. This feature allows some additional versatility without needing to "set-up" the other switches previously.

IMPORTANT: A second switch at the printer would be called the "transmit" switch, and would also parallel the remote standby line. It would be a DPST or DPDT switch, one pole would turn the transmitter on, the other pole would short the remote standby line, thus "single-switch" operation is provided. If the motor was not running, you would merely turn the switch to "transmit" and both the printer and the transmitter would immediately start up.

MISCELLANEOUS

We appear to have covered most of the salient features of the ST-6. To quickly go over the switches, then;

- S1 is the limiter on-off switch. When on, it provides normal "FM" copy, when off, "AM" (two-tone or limiterless, if you prefer). When in "limiter off" it also disables the autostart and keeps the motor running.
- S2 is the normal-reverse switch, no explanation needed.
- S3 is the standby switch, places the unit in markhold and also disables the autostart, which keeps the motor on or turns it on if it was off. The remote standby switch does the same thing, but is conveniently located at the printer; also on the transmit switch.
- S4 is the fast-slow autostart switch, for "quick break" where the operator is present and the 3-4 second turn-on time is a nuisance but automatic printer control is still desired -- also in "fast" keeps the motor running indefinitely.
- S5 is the autostart "off" switch, this also keeps the motor running. There may be times you wish to have com-

plete manual control, like during bad conditions when running fast break, etc. S6 is the manual motor "on" switch. S7 is the 120 VAC power on-off switch, this also opens the FSK line when the power is off, to prevent any hum loops from the transmitter to ground.

Printed circuit boards designed by the author are available for the ST-6. They may be purchased from:

STAFFORD ELECTRONICS
427 SOUTH BENBOW ROAD
GREENSBORO, N. C. 27401

These particular boards use the round "TO-5" op amps with the 8-pin wire leads. The "dual-inline" 14-pin packages will not fit these boards.

These are six boards total, however if you wish to add both 850 as well as 170 shift, you duplicate the first two boards for a new total of 8 boards. Here are the prices:

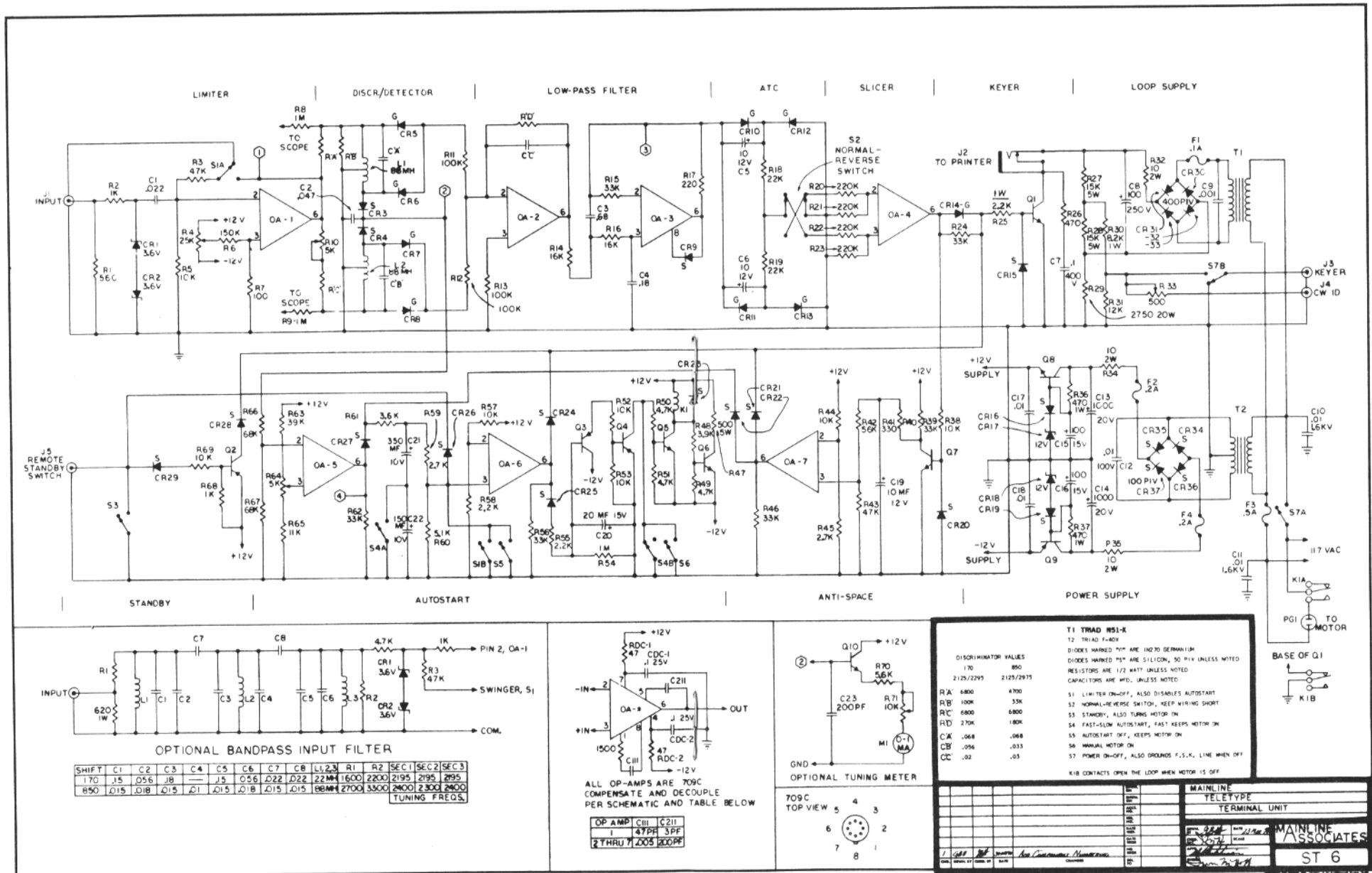
	6 boards	8 boards
drilled	\$16.05	\$21.80
undrilled	\$10.50	\$13.50

IMPORTANT: BE CERTAIN TO INCLUDE \$1 ADDITIONAL FOR HANDLING, POSTAGE, AND FOR DATA SHEETS RELATIVE TO PARTS PLACEMENT.

Other firms will most likely offer p.c. boards later on, as the popularity of the unit increases. Over 250 enthusiasts have already sent for the giant schematic we mentioned was available when the ST-5 was published a few months ago.

PERFORMANCE

This is still being evaluated. The TT/L and TT/L-2 set a level of performance that is extremely difficult to exceed, I have yet to see a commercial unit that will outcopy a TT/L or TT/L-2 assuming the deluxe 3-pole Butterworth filters were added to the Mainline unit. The ST-6 has inherently more residual potential (by some margin) than the TT/L-2, plus having the advantage of smaller size, lighter weight, very little heat, etc. At this writing about 8-10 of the ST-6 have been completed. Most of those are being used by people already having the TT/L or TT/L-2. In every case so far, the reports have indicated that in comparative tests using the same receiver and similar printers that the ST-6 gave noticeable improvement in copy. Other reports had little to do with the overall perfor-



mance, just indirect comparison -- the users were enthusiastic over the autostart operation, were quite pleased with the versatility and simplicity of the various switches, were enthused by the attractive and commercial appearance which the p.c. boards gave, etc. Several people were quite pleased with the anti-space feature (the TT/L-2 has this also), as well as the small size, low power drain, etc. These items all add up to an overall impression.

The one feature those having both the TT/L-2 and the ST-6 commented on without exception was its rapid recovery after a temporary loss of synchronization due to static on 80M in particular. Several people having the ST-6 have already sold their TT/L-2 units, and one -- Bill Sherwood W6FBY now has two ST-6's in replacement for the two TT/L-2's and one ST-4 which he has sold.

(TO BE COMPLETED IN NEXT ISSUE)

HINTS from READERS

Cole, W2FLJ, has researched the correct drill sizes for drilling PC boards and sends the following list. . .

For OP AMPS leads such as 709C	#77
For 1/4 watt resistors	72
For 1/2 watt resistors	65
For 1 watt resistors	58
For 2 watt resistors	56

There are now carbide drills available in these small sizes for epoxy PC board drilling. Ordinary carbon steel drills will only be good for about 100

ELMERS Glue-All (white glue) makes a beautiful adhesive for tape. Put thin coat of glue on the tail end of the tape for the loop, put tape start on TOP of loop end, align guide holes, press with fingers for a few seconds and the loop is ready . . . W5HDM via W9BT. ****

A great many of the TD's in use in the shack have an electro-magnetically operated clutch. I have noticed that most of these coil assemblies have a shading coil (a "D" shaped piece of copper placed on the polepiece under the armature). This indicates the coil will operate directly from AC. I have two model 19 TD's and have been operating them right off the 120 VAC motor leads for quite some time with absolutely no problems. This saves two leads from the TD to the DC supplies and frees the DC supplies for magnets only.

K3RND/AFA3RND

12 September 1970

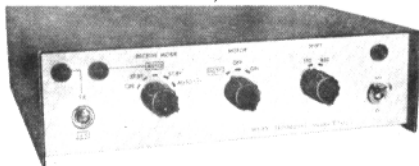
COST

If all parts are bought brand-new, and all 8 circuit boards obtained pre-drilled, the total price would be close to \$150. Several firms are planning parts packages which will substantially reduce this cost. John Hill W4WXJ built his on vector boards prior to the time the p.c. boards were completed, and he estimates he has \$70 in the total unit, for both shifts.

NEXT MONTH

In the October issue we shall discuss parts peculiar to the ST-6, show additional photos of the author's unit, mention some hints on construction, and go into tune-up and alignment instructions. The lamp driver circuit for "mark and space" lamps, or for "standby and receive" indicators will be included. As will anything else we think may be of interest.

The large schematics are still available from the author for \$1, postage paid. Add an extra \$1 for air mail outside the USA.



We have received a brochure from Ole Berland, OZ6ØB, designer of the TT/L-MKT demodulator described in the December 1969 JOURNAL, of a commercial built model. The Manufacturer is --

TELE-TRADING, 12 Yorkvej, Ølstykke, NORWAY.

The model -- TTU -- FSK terminal unit is completely self contained and provides all the necessary interface circuitry between a single sideband, FM or AM transceiver and a teleprinter machine used in RTTY operation.

The price is approximately \$195, USA funds. Ole or the manufacturer will be glad to answer any inquiries.

Through the courtesy of Clyde Keenan, K7WTQ we have another supply of excellent drawings of the Solid State TT/L-2-MKT demodulator and controls system. There are 12 letter size drawings in all. Available at 50¢ to cover postage and handling. This is the demodulator by Ole Berland, OZ6ØB, that was published in the December 69 and January 70 issue of the Journal.

BROAD MINDED

USE NARROW SHIFT

RTTY JOURNAL

VHF RTTY NEWS



RON GUENTZLER, W8BBB Editor

Route 1, Box 30
Ada, Ohio 45810

BARTG VHF RTTY CONTEST 1970

1700 GMT Saturday, October 24 until 1700 GMT Sunday, October 25.

Licensed Amateur Radio Stations within Zones 14 and 15 are permitted to use RTTY as a mode of operation. Portable operation will be permitted, but must be from one location for the duration of the contest.

144 MHz and 432 MHz amateur bands. 70 MHz amateur band for United Kingdom stations. (This will be considered as a separate contest during the same period.)

Stations may not be contacted more than once on any one band. Additional points can be claimed from the same station if a different band is used.

Messages will consist of:

- Message number.
- Time GMT.
- RST report.
- QRA locator (Standard 5 symbol locator) or QTH given either as a town or as a bearing and distance in km from a town. The town MUST be identifiable on a normal tourist road map.

Points:

- All two-way RTTY contacts will score in accordance with the distance chart below.
- All stations will receive a bonus of 200 points per country including their own.
- Band multipliers as follows: 70 MHz & 144 MHz, band score X 1; 432 MHz, band score X 10.

Distance:

- | | |
|-------------|-----------|
| 0-50 km | 1 point |
| 50-100 km | 3 points |
| 100-200 km | 6 points |
| 200-300 km | 10 points |
| 300-400 km | 14 points |
| 400-500 km | 18 points |
| 500-600 km | 22 points |
| 600-700 km | 26 points |
| 700-800 km | 30 points |
| 800-900 km | 34 points |
| 900-1000 km | 38 points |

RTTY JOURNAL

Scoring:

- 2 way exchange points X countries worked per band.
- Country points X band multiplier.
- Total score equals a plus b.

Logs:

Use one log per band. Logs to contain: Message number, Time GMT, Call sign of station worked, RST of his signals, QRA or QTH received. Estimate distance and points claimed.

All logs must be received by 21st November 1970 to qualify.

Certificates will be awarded to the top scorers, fixed and portable, on each band in each country.

The judge's decision will be final and no correspondence can be entered into in respect of incorrect entries.

Send your logs to:
Ted Double G8CDW

BARTG Contest Manager
89 Linden Gardens
Enfield, Middlesex, England

Many thanks to Ted for the information. Although there are many stations outside Zones 14 and 15 who are not permitted to participate, we thought that it might be a good weekend for some VHF RTTY SWLing, and therefore published the information here.

We understand from W4VZR that there is some VHF RTTY activity in the Washington-Baltimore area. It is on 146.700 MHz, 40F2, vertically polarized, using the standard 2125 Hz Mark, 2975 Hz Space. The stations listed are W4VZR, W3HSP, and W3YVV who runs autostart continuously. There is also some AM activity on 145.44 MHz.

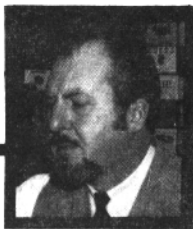
Hank Hunt, WI0RI, reports he had a QSO with K9CGD on 18 July 1968 at 0031 GMT on 6 meters. They were using AFSK on AM. Could this be a DX record? Don't know. Sounds good to me. Anyone want to top them?

George Falter had the following news:
Continued on page 20

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RTTY-DX

JOHN POSSEHL - W3KV
Box 73 Blue Bell, Pa., 19422



Hello there . . .

It seems like a long time since we last said "Hello" but the calendar says only two months. There has been a lot of activity and we had better get right to it, so without further ado, here we go.

After some preliminary tests with some of the boys using SSB and CW, Jo, CR6CA made the very first two way RTTY contact on June 17. His first QSO was with DK3CU and from that moment on Jo has been a very busy fellow. He is using narrow shift, which is inverted, but of course this is no real problem. Jo did have some difficulty on receiving which usually required a series of RY before each transmission so he could get the station he was in QSO with properly tuned in on his TU. To use Jo's words, "My home brew TU is very unique. It accepts all shifts on all frequencies all at the same time, causing me great difficulty". These problems should be solved by now as Charlie, W5QCH, has been of great help in getting all the necessary material for the ST-5 to Jo. At this writing he has all the parts and should be using the new TU by the time you read this.

One of the early QSO's from CR6 CA was with Leo, EL2BD, just hours before Leo went QRT for good. This contact gave both stations Africa for W A C. It took Leo over a year to find an African QSO and Jo made it in the first few hours of operation.

Jo also assures us that there will soon be RTTY activity by his friend Henry, CR7DB, Henry is also licensed for Malawi (7Q7) and Swaziland (ZD5) so activity from that continent looks promising for the future. Incidentally, Jo is also licensed as CR5MA, and he will try to make a trip there and put Sao Thome on RTTY. This prefix is really rare in any mode. QSL's can reach Jo at --

Joao de Sacadura Cabral
 Rua Cabral Moncada 18
 Luanda, Angola

While Jo was causing all the excitement

DX HONOR ROLL

1. FG7XT	101/91	30. W5VJP	37/32
2. ON4BX	92/89	31. VE5LG	37/31
3. I1KG	90/85	32. WA2YVK	43/29
4. W3KV	87/79	33. VK3DM	36/29
5. ON4CK	80/74	34. K6EV	33/29
6. K8YEK	72/68	35. W4EGY	37/28
7. W8CQ	69/66	36. ZL2ALW	37/27
8. W4YG	62/60	37. CE3EX	37/27
9. VE3AVL	63/59	38. WB6QFE	31/27
10. W5QCH	61/57	39. G3IYG	33/25
11. W3ISE	60/55	40. WB6RXM	37/24
12. K8QLO	61/53	41. HK3SO	28/23
13. WA6WGI	57/53	42. SV0WO	32/22
14. G6JF	55/51	43. PJ2CR	31/22
15. I1ROL	54/46	44. VE4FG	23/21
16. W2LFL	54/46	45. DL8VX	33/20
17. W6CG	51/46	46. KG6NAA	32/20
18. W1GKJ	52/45	47. OZ6OB	33/19
19. K4VDM	44/43	48. W0HAH	32/19
20. K8JTT	44/42	49. W1ACW	28/19
21. WA8BOT	51/41	50. W3AVQ	22/19
22. I1CAQ	43/40	51. G3LDI	26/18
23. W8CAT	41/39	52. K9BJM	23/18
24. WB6ADY	39/38	53. KL7EBK	27/17
25. XE1YJ	41/37	54. K9QNV	24/17
25A VK3ABN	39/37	55. HP1XHG	24/15
26. VK3NR	51/33	56. I1THB	22/15
27. I1CGE	42/33	57. DL3NO	20/14
28. W7VKO	35/33	58. FY7YQ	10/10
29. VE4BJ	33/33		

Please be reminded that the next posting of the Honor Roll will be in the January issue.

In order to set standards as to what constitutes a country for RTTY - DX the Journal will use the ARRL COUNTRIES LIST and DX CENTURY CLUB RULES in processing applications for the RTTY DX-CC AWARD.

In recognition of the excellence of performance, operating skill, patience, and endurance, the RTTY JOURNAL will award a handsome trophy to the first station to achieve RTTY - DXCC and subsequent applicants will be rewarded with an engraved certificate befitting the occasion.

RTTY JOURNAL

ment at one end of the band, Pierre, FY7-YQ, showed up with a beautiful RTTY signal at the other end of the RTTY segment on 20 meters. ON4BX was his first QSO and Pierre has been doing a great job in putting that rare French Guiana prefix in many RTTY logs. He is using a SB-401 on FSK, a Collins 75S-3C receiver, a Model 15 printer, and the TU for the moment is a very elementary "one tube" job which quickly becomes paralyzed under QRM conditions. Pierre is in the process of improving that situation so he should be printing better soon. Incidentally, we also received word of Pierre's activity and a photo negative from his good friend Jean, F8KL. It seems that they are both from the same town in France. That is Meudon. And of course, everyone knows that Jean is "le grandpere" of RTTY in France.

Pierre is an Engineer by profession and has been in Guyane since 1967 so continued activity from this rare prefix seems assured for some time to come. He is very prompt with QSL's and can be reached as follows --

Pierre M. Courtier
 Box 22, St. Laurent
 French Guiana

A DXpedition from France was due to be on RTTY from Andorra during the period August 1-15, but as of this riting they had not yet appeared. As usual, we are writing with one hand and tuning the receiver with the other in anticipation of printing them but I guess one cannot always be so fortunate. F2PY and F5JB were doing the operating and I am sure that any preliminary problems were resolved and that tremendous pile-ups were caused on 15 and 20 meters with the call - C3-1BT --

Jean, FG6XT, informed us that he would be operating as FG7XT/FM7 from Martinique for the week-end of August 8. Jean had operated from there a year or so ago and one of the objective of this visit was to repair the TU he had left there. This could mean continued activity from there. His plans for operating from VP2 (British Virgin Islands) had to be shelved for the time being as he has been unable to obtain a RTTY license partly due to the unsettled political situation there at this time. Jean further states that he was fortunate along with F3LL to make RTTY contact with Yvon, FP8CY, before Yvon went QRT and QSY to the Comoros Islands. He now has the call, FH8CY, and hopes to be active on RTTY at about January.

RTTY JOURNAL

We recently had a CW QSO with FB8YY, Terre Adelie, and when questioned, the operator, Andre, said that they would be QRV on RTTY in October, Operations will all be at the 50 Baud speed however. Some of you may recall the RTTY activity from this station in 1966 and are advised that it counts as Antarctica for DXCC purposes.

Recently activity has been renewed from Bermuda with the operation from K2RSR/VP9. Frank puts out an outstanding signal and will be active from there for quite some time. QSL's can go via --

Box 275, Hamilton
 Bermuda.

Say fellows, never give up on the QSL's Arthur, ON4BX, just received one from Georgia, USSR, for a QSO back in 1967. That was when the Riga (Latvia) Institute of Radio was operating a DXpedition from Georgia with the call 4L3A.

Our congratulations go to Giovanni, I1KG, for the excellent job he did in winning the B A R T G Contest. You will find the results tabulated elsewhere in this issue. If you look real close you will see last but by no means least ZD9BN, Gough Island!!

Congratulations are also in order this month for W A C --

Nr 130 Arthur E. Olson W7LZF

Art is located up in the State of Washington and he made all the contacts and received all the cards in the first six months of this year.

From the Far East Gin, JA1ACB, comes up with following interesting information. John, KR6JT, will shortly be visiting Indonesia (YB0) and will bring a machine along with hopes of operating from there. John will also send a machine to Singapore in the hopes someone picking up on RTTY where 9V1PG left off. Sam is now QRT from there Phil, VS6DR, is still having difficulty in getting licensed for RTTY in Hongkong but is still hopeful that the near future will bring good news. Gin has also increased his power to about 800 watts so you should have no trouble printing him if conditions are anywhere right.

In the W A S department, Uli, DK3CU is desperately looking for RTTY contacts in Nevada, Utah, Idaho, and Montana. Uli will appreciate any help that may lead to a QSO. Uli is also working on getting RTTY activity going in Rumania (YO). The diffi-

Continued on page 20

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Starting September 20th Crys and the writer will be taking a trip through the New England States. We plan on attending the National ARRL Convention in Boston September 25-27 and hope to run into some of our RTTY friends. We plan on being on SSB mobile during the trip and will probably check into Eastcars and Midcars

We have seen considerable correspondence from a number of foreign RTTY societies attempting to promote separate, exclusive frequencies for RTTY operation. In Europe where some mode restrictions are different than ours QRM is probably more of a problem especially on the lower frequencies but QRM is with us everywhere. We have written to several of the originators of the idea and although we do not attempt to be speaking for anyone but ourself we are completely against the idea.

First - and the only reason necessary, is that it would never be passed by our FCC. It has been a firm policy, and we agree, to make as few separations depending on mode as possible.

We have campaigned for space for RTTY, and have generous segments that we can use now - why should we ask to have these frequencies limited even if for exclusive use. Any one that is on the air much knows that at times there are few if any RTTY signals around, what would the CW fellows say when there was a clear spot with no signals and they could not use them.

QRM is a problem with RTTY but where can you go, and on what mode that the same problem doesn't exist? We feel that better understanding between the RTTY and CW boys could help the problem. We also QRM them and I am sure that if the CW operators were aware of the segments most used by RTTY they would co-operate. If you doubt this ask the next CW man you talk to where RTTY usually operates - ten to one he can't tell you, all he knows is that dam rattle QRM ed his QSO. Possibly we can get

16 September 1970

some editorials in the general magazines along this line. In the mean time lets get some sharper filters, narrow shift, and I am sure we can hold our own. We have generous allotments of frequency now, if we need more than our usual 15Khz we can expand, if the band is dead others can use it as required. For heavens sake let's don't kill the golden goose.

From the ARRL we received a complete list of all RTTY articles that have been published in QST. We have this list ready to go as soon as space permits.

BACK ISSUES---

THE ONLY back issues available are: July through December 1966. No issues of 1967. All issues of 1968 except for January and November. (July-August is one issue). All issues of 1969 and 1970 to date. All copies are 30¢ each.

RTTY Journal Binders are \$2.50 each in USA. \$3.00 in Canada or Mexico. Custom regulations make it impractical to ship binders overseas.

All copies of the TT/L-2 reprint are exhausted and as this article was reprinted in QST, May and June 1969, we plan no future supply.

RTTY JOURNAL

P.O. Box 837 Royal Oak, Mich. 48068

"Dusty" Dunn — W8CQ

Editor & Publisher

SUBSCRIPTION - 1 Yr. (11 issues)
U.S. - Possessions - Canada - Mexico

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Air Mail - South, Central America \$5.00
All Others - Air Mail - \$5.50

RTTY JOURNAL

MITES in Ham Shack

Continued from page 4

pins A and C - 115 volts A.C.
pin B - ground
pins J and K - External loop supply from T.U. (100-250 V. D.C.).

This will set the MITE up for use with existing equipment and is perfectly compatible with other types of teleprinters to be used in series with the MITE.

IMPROVING THE MITE

The following modifications can be made on the MITE models AN/TGC-14A (V), TT-299A/UG and TT-299B/UG, or any model with 6-contact keyboard slip connectors. This modification cannot be used with the AN/TGC-14(V) nor with the TT-298B/UG models unless the 6-contact keyboard slip connector has been installed in place of the 2-contact connector ordinarily found in these models (the TT-298B/UG also lacks a keyboard.)

This modification will permit the use of a reperforator and T.D. or a reperforator -- T.D. combination such as the FRXD models with the MITE. With these additional machines, one gets the flexibility and convenience of a model 19 out of the MITE and requires only the existing printer keyboard. One is able to punch a tape from the MITE keyboard while receiving copy on the MITE page printer or punch tape while page printing from either the air or keyboard. An additional loop supply is not required.

First, one must rewire the 6-contact keyboard slip connector (see arrow, figure 1). Remove the keyboard from the printer. Locate the keyboard slip connector and note the numbered contacts from 1 - 6 going from RIGHT to LEFT.

Unsolder the wires to all contacts of the slip connector being certain to keep track of the wires to contacts 1, 2, 3 and 4 (they are usually coded).

Rewire the contacts so that the wire originally to contact 2 is to contact 3, the wire originally to contact 3 is to contact 1, and the wire originally to contact 4 is to contact 2.

Solder a wire jumper to connect contacts 6, 4 and 2 together.

Locate the key board send-receive switch next to the break button on the left side of the keyboard. To get to this switch remove the typing key guard plate on the bottom of the keyboard directly under the green typing keys. With the guard plate

removed, locate the wire from the break switch to the send-receive switch and from pin 3 of the keyboard contact filter (see A figure 2) to the send-receive switch. The keyboard contact filter is the metal can with 4 pins on it directly behind the send-receive switch.

Rewire pin 3 of the keyboard contact filter directly to the break switch.

In order to proceed further, the send-receive switch must be removed. Remove the round nut from the break switch (B figure 2). Remove the screws holding the keyboard cover and remove the cover. Remove the send-receive switch, carefully noting its orientation for reassembly.

Two wires should already be present on the switch. These wires go to the re-wired keyboard slip connector contacts 1 and 2. Trace the wire originally removed from slip connector contact 1 back to either pin 1 or 2 of the keyboard contact filter and disconnect this wire at the filter. Wire the remainder of the send-receive switch according to figure 3.

Re-install the switch upside down from its original position to properly orient it for modified operation and reassemble the keyboard.

Turn the printer section of the machine on its side and locate the contact strip for the keyboard connector (see fig. 4). Disconnect the wires to pins 3 and 4 of this contact strip (the two middle pins). Locate jack 5 and jack 1 on the rear of the machine as previously described. Wire pin 3 (or 4) to jack 5 and pin 4 (or 3) to jack 1. Wire the magnets of the reperforator and T.D. contacts directly to pins L and M of the 12-pin Amphenol plug on the rear of the printer.

The unit is now ready for more versatile operation. With the send-receive switch in the SEND-REC position, the keyboard will run the MITE page printer and the accessory reperforator from the external T.U. loop supply. With the send-receive switch in the REC. position, the MITE printer will copy off of the T.U. loop while the MITE keyboard will run the reperforator off of the internal loop supply at the same time. This allows one to cut a tape while receiving and instantly switch back to keyboard transmit when desired.

It is hoped that this article will be a vanguard in a series of articles on MITE and other non-Teletype machinery. This author welcomes correspondence from other MITE owners, and will gladly offer any assistance he may be able to provide.

September 1970 17

RTTY JOURNAL

SPECIAL RTTY TEST TAPES: super-durable Mylar, for CQ, "fox" tests, etc., 5-level only, endless loop with any short message - 50¢ - G. White, 5716 N. King's Highway, Alexandria, Va. 22303.

TYPEWRITER RIBBON REINKER, Hand operated model now only \$3.50. K575 or K764 Ink available at all National Cash Register Co. stores at 75¢ per tube. Walter Nettles W7ARS-8355 Tanque Verde Rd. Tucson, Ariz. 85715.

FM SCHEMATIC DIGEST: Extensive collection of Motorola FM Schematics, Crystal Alignment, and servicing information, 136 pages 1 1/2 x 17. \$6.50 postpaid. S. Wolf, 1'00 Tremont St., Boston, Mass. 02120.

CASH FOR BACK ISSUES of radio magazines. Especially want April 1953 RTTY. Orville Magoon, K6DZN, 1941 Oakdel Dr., Menlo Park, Calif. 94025

RTTY PICTURES FOR SALE. Volume 1, 8 pages \$1.00. Volume 2 16 pages \$2.00. Over 100 different pictures. Audio and perforated tapes available. W9DGV, 2210-30th. St. Rock Island, Illinois 61201.

SELL: COLLINS R-392 with power supply, excellent mechanical and electrical condition; original power and output plugs; complete manual. Dream RTTY, FAX, SWL receiver; .5-32khz; digital dial readout; \$500.; will pack, you pay freight; J. Salter, K59QA, address above; 214-328-1221.

WANTED: PLATTEN for Model 15. Prefer used but good condition. R. Wanat, WA8LIX/4, 443 Atlas Dr. Madison, Ala. 35758

SELL OR TRADE: Two model 15 printers, Ameco 2 meter converter, L & W 50 watt 6 meter AM transmitter with power supply. Make offer. Glenn Kurzenkabe, K3SWZ, 3600 Marrr Dr. Camp Hill, Pa. 17011. Phone (717) 737-2341.

MODEL 15 PAPER REWINDERS - unused, commercial version similar to page 14 RTTY July '1970 - only \$11.50 postpaid. RCA Low band CMV3 FM Mobiles, removed from working system - \$36.00. Accessories add \$6.00 Free lists on RTTY, electronics, Fax and books. Jim Cooper, 834R Palmer Ave. Maywood, N.J. 07607

PROVEN THE LEADER - in handling traffic - ease of operation - solid copy - trouble free - ignore QRM the Mainline TT/L-2 FSK demodulator custom built, exactly as described in May QST, by J & J Electronics. If you have tried the rest -- now try the best. Contact OM WISOG for further details. J & J Electronics, Canterbury, Conn. 06331. Ask the man who owns one.

FOR SALE: Mainline TT/L-2, 90% complete, 8-3/4" rack panel, PC board wired & all parts mounted. Professionally constructed. \$75 F.O.B. K1LPS. P.O. Box 47, Peacham, Vermont 95862

WANTED: #28,32,33,35 ASR & KSR page printers, complete or parts. We pay cash and freight, or trade for new ham equipment. All-tronics-Howard Co. Box 19, Boston, Mass. 02101. (Tel: 617-742-0048)

SAROC, JANUARY 7-10,1971, Flamingo Hotel Convention Center, Las Vegas, Nevada. Sponsored by Southern Nevada ARC, Inc., Box 73, Boulder City, Nevada. Advance registration \$14.50 per person accepted until January 4, regular registration at door, includes Flamingo Hotel Late Show and drinks, Sunday Breakfast, Cocktail Parties, technical seminars and meetings, ARRL, DX, FM, MARS, QCWA, WCARS - 7255, WPS5-3952 and WSSBA Ladies Program. Flamingo Hotel SAROC room rate \$12.00 plus room tax., per night, single or double occupancy January 3 thru 12, 1971. Mail accommodations request to Flamingo Hotel Mail advance registration to SAROC, W7PRM Club President, W7PBV, SAROC Convention Chairman.

J & J ELECTRONICS will carry a complete line of solid state demodulators. A model for the beginner to pro. For further details see August QST 1970.

COLLINS 32V-2 TRANSMITTER in exceptionally good condition \$150.00 and Gonset GSB 201 (late model) 2 KW amplifier \$275.00. Want typing unit for 28 KSR. Ronald Ott WA6FAD 2908 Benvenue Avenue, Berkeley, California 94705

FACSIMILE MACHINES: RD92A/UX and TXC-1B. Your choice, with 100 sheets paper, \$125.00. Also M14TD, \$25.00. Need Mite motor. F.K. McGinnis, 4304 McFarlin Blvd. Dallas, Texas. 75205

TELETYPE PICTURES FOR SALE: Volume 2, 16 pages containing 50 pictures \$2.00. Volume 3 coming \$1.50. Also audio and perforated tapes. W9DGV-a 2210 30th St. Rock Island, Ill. 61201.

PARTS KITS FOR ST-6: Build this sophisticated terminal unit, all solid state using P.C. boards. I.C. OP AMPS, with auto start and many other features. Send SASE for information on parts kits now available. Write W1KJL, PO box 689, Portsmouth, N.H. 03801

ATTENTION: FOR SALE: RCA CV-71 I.F. Demodulator. 50KC version of CV-57 for Drake, Hallicrafters, surplus, etc. Scope, AFC, many extra parts, cables, manual, etc. \$85.00 or offer. Galaxy V Mark 2, AC supply, console, VOX, perfect \$375. Gonset G-50, \$150. Bill Handel, K8SSY, 95 Murwood Dr. Chagrin Falls, Ohio, 44022. (216) 247-6130

FREQUENCY SHIFT CONVERTER CU/89/URA-8-A, wide and narrow shift. Operates on 110 volts built in scope complete with manual, connectors and in excellent condition. \$150 W8YFE 20350 LaCrosse Southfield Michigan 48075 Tel. 313-353-7926.

ADDITIONAL CLASSIFIED ON NEXT PAGE

Additional Classified on Page 18

LOADS OF BARGAINS in teletype, telegraph, telephone facsimile and electronic equipment and parts. No list or catalogue. Phone anytime and will be happy to come down on a Saturday or Sunday. Phone (312) GR 6-8200. C.B. Goodman & Co. 5826 South Western Ave. Chicago, Ill. 60636

FREQUENCY COUNTER - Berkley model 554A. Direct digital readout to 100 Khz. Complete with cabinet. Front panel 19x8 3/4. Can be rack mounted. Excellent condition. Will trade for model 28KSR in similar condition. Will not ship but will meet halfway within reasonable distance. R.M. Cooper, 62 Brookside Ave. Hawthorne, N.J. 07506.

"2 METER FM RECEIVER: 11 transistors, 3 I.C.'s; easily built with our set of P.C. Boards - drilled, tinned and with terminals installed -- \$9.50/set P.P. 2 Meter MOSFET Pre-amp - P.C. Board drilled, tinned, and with terminals -- \$1 85 ea P.P. RMV Electronics, P.O. Box 283, Wood Dale, Ill. 60191

TELETYPEWRITER; KLEINSCHMIDT, type TT100B/FG, sendreceive, friction or sproket feed as desired, 60, 100 wpm, used good \$60. each. Receiving set, type AN-URR-13, A2,A3 type of emission received. Frequency data 225 to 400 MC, frequency range 1 band, 1 channel, audio type presentation, 115 volt, 1 phase, 60 cycles, used, good, \$60. Keyboard; for model 15 teletypewriter with here-is answer back attachment, used to set up identification, 20 functions or characters, used good, \$10. each. Atlantic Surplus Sales, 580 3rd Ave. Brooklyn, N.Y. 11215

WANTED; JOHNSON VIKING 500 Complete R.M. Margeson, 6255 Fishburn Ave. Bell, Cal. 90201

MAINLINE ST-6 PC BOARDS and parts available. Please allow us to quote you on boards or on the complete unit. Write for details. HAL Devices, Box 365RJ, Urbana, Illinois 61801

SOLID STATE TU/AFSK generator based on units in July 1969 73 and September 1969 QST. All circuitry including PS on 3x6" G10 glass PC board, 850 and 170 H3 shifts, CW ID, zener protected transistor loop switch, reversing switch, high and low impedance output FET audio. \$40.00 kit form. Cabinet \$6.50 extra. Board only \$4.50. 3 pole Butterworth filter boards, drilled 3x6" G10 glass, \$2.50. Write for details. HAL Devices, Box 365 RJ, Urbana, Ill. 61801.

WANTED TELETYPE: Models 28, 32, 33 and 35 and accessories, printers, etc. We pay freight and highest prices. Cash or trade. Call collect if you have COMPLETE sets to offer. AMBER INDUSTRIAL CORPORATION, P.O. Box 2129 South Station, Newark, N.J. Tel: 201-824-1244.

TOROIDS; LOWEST price anywhere. 40/\$10 postpaid. Center tapped 88 mhy or 44 mhy. 32KSR printer reconditioned, perfect \$200. Lorenz ASR page printer (all 60 speed) \$100. Fresh perf tape 11/16 \$10/case 40. Electro-sensitive facimile paper \$3. box/250. Stamp for list. Van, W2DLT, 302 R Passaic Ave., Stirling, N. H. 07980

RTTY JOURNAL

AIRLINE TTY SYSTEM for sale. Models 14, 15, 19, and 26 available. Northern and military converters w/manuals. All FOB Burbank or Seattle. Send post card with requirements to Bob Schaeffer, W7YKF/KL7, 4116-West 88th St., Anchorage, Alaska 99502.

A REAL BUY: Scope tuning modules from URA8 series converters, new with all tubes. Get a spare at \$13.50. W3LST, J. Szabat, 228 Plummer, Oil City, Pa. 16301

WANTED: TELETYPE MODEL 28KSR in good condition. Prefer "mouse machine". Have Model 28KTR keyboard typing reperfr in new condition with all features, Model 28KSR keyboard, base with motor and cabinet with LESU and/or brand new SBE-34 with mike and crystal calibrator for swap. Ronald Ott WA6FAD 2908 Benvenue Avenue, Berkeley, Calif. 94705

WANTED: the following Model 28 parts - LAK42ARN keyboard, LAAC237BR cabinet, LTPE1AWA perforator, 161815 tape handling mod. kit, 176287 aux. base mtg. parts, 164024BR copyholder. Jim Overstreet, WA5DXP, 228 Coolidge St., New Orleans, La. 70121

PAPER; PAGE PRINTER and reperfr. Type MXD 3 channel TD \$45. BC221 w/book & AC supply \$53, very good. HW18-160 meter Xcevr \$48. Antenna switch/115 vt coil \$7.50. Parts for that homebrew linear and more. J. Thompson, 21 Kurtwood Dr. Council Bluffs, Iowa, 51501

TTL/2 PRINTED CIRCUIT BOARD (QST, MAY 69) and two-frequency Discriminator/Filter Circuit Board (QST June 69, 6 x 9 inches, highest quality material, either board, \$6.00 postpaid, USA. Also, single Discriminator board or Filter board (QST, June 69), \$2.00 each. Jim Salter, K5BQA, 11040 Creekmere, Dallas, Texas, 75218.

TI SN72709L (round TU-5), SN7209 (DIP) OP AMP, \$1.50, 7/\$10.00. Molex DIP IC terminals, 25¢ each. Cinch 14 DIP, 8ICS DIP and round TO-5IC sockets, 60¢ each. Cinch 50-12A-20 12 pin edge connector, \$1.70 each. Motorola MC89OP/MC790P \$2.00. MC724P, MC789P \$1.05. Other MRTL including decade counters and decoder/driver in stock, HP-2800 Hot Carrier diodes 90¢ each, 12/\$10.00. matched 4/\$4.25. Fairchild 900, 914, 60¢, 923 90¢. All items new and fully guaranteed. Get our catalog. HAL Devices, Box 365RJ, Urbana, Ill. 61801.

FL-1 FILTER-LIMITER Kit. HAL offers the filter limiter of the Mainline ST-6 for use with any TU. 3 pole Butterworth filter and 709N OP AMP on 3x6 G10 glass PC board. Complete kit including toroids and 12 pin edge connector \$11.00. Requires ±6 Or ±12 VDC. Write for more information on HAL RTTY Products. HAL Devices, Box 365RJ, Urbana, Ill. 61801.

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