

M32RO, M33RO TELETYPES: Prices from \$150 to \$275 FOB. Also fast parts service on all 32/33 K1YCM Les Veenstra, ACTON TECHNICAL SERVICES, 919 Crystal Springs Ave., Pensacola, FL 32505. 904-434-1297

HAL COMMUNICATIONS CORP. announces the DKB 2010 Dual Mode Keyboard. Provides flawless transmission of RTTY and Morse Code with standard 3 character buffer and optional 64 character buffer. Call letter identifier and "Quick Brown Fox" sequence standard. Write for detailed spec sheet. See it on display at Dayton. HAL Communications Corp., Box 365RJ, Urbana, IL 61801. Phone 217-359-7373.

WESTERN ELECTRIC MERCURY RELAYS 314A AND 314B. Direct replacement for 255's/ 314B has built in suppression. One or a dozen at 1.75 each. Dealers make offer for lots of 100 each. Robert Monarch, 1214 Akin Drive, Evansville, Indiana 47714

WANTED; CV89/URA-8A manual, National 5880-AB power supply, SW-3 10-20 series coils, B&W 515B and a telegraph sounder, George Marts, 4201 Colvin Dr. St. Louis, MO, 63123.

"GET A TABLE FOR YOUR TELEPRINTER. Designed for Kleinschmidt ASR with 40 x 23 x 27 dimensions. Great for either a single printer or printer and reperf. \$17.50 FOB (compare at \$34.95) WB5HGQ, 2117 Westlake Drive, Plano, TX 75074"

DX Cont.-

CONTINUED FROM PAGE 15
 Spring BARTG Contest was about to happen. Hope you had fun and that the condx were good. Look forward to the WAE Contest next month, April 20-21 and note that it is one week sooner than in past years. No excuse for you Dayton migrants not getting in it this year.

DX - RTTY April 1964
 Irv, K8DKC (now W6FFC) reports working W8BZB/HC2 on 80 meters. Many stations also report working Rafael, YV5AVW on 80 also. Horacio, LU1AA is waiting for a QSL from Africa to complete his WAC. W6CQK is trying for permission to set up a RTTY DXpedition to the Island of Aruba. W7CTK reports several good contacts with HL9KP on 14 mhz. Martin, OY7ML is reported active.

All made possible with the assistance of, W2LFL, W3DJZ, W4CQI, W4YG, K6WZ, JA1ACB, LU2ESB, ON4BX, VP2KH, many thks.

73 de John

FIRST CLASS MAIL

Address Correction Requested
RTTY JOURNAL
 P O Box 837
 Royal Oak, Mich. 48068

RTTY

April 1974

JOURNAL

EXCLUSIVELY AMATEUR RADIO TELETYPE

VOLUME 22 No. 4 30 Cents



Dual Mode Keyboard

HAL Communications Corp. announces the DKB-2010 Dual Mode Keyboard, the solid state keyboard that allows you to send either RTTY or Morse Code. One of the most sophisticated products ever offered to the amateur radio operator, the DKB-2010 offers ease and versatility of operation never before available.

In the RTTY mode, you can transmit at standard data rates of 60, 66, 75, or 100 WPM, as well as an optional 132 WPM, 100 baud. In addition to the complete alphanumeric keys, you get 17 punctuation marks, 3 carriage control keys, 2 shift keys, a break key, 2 three-character function keys, a "DE call letters" key, and a "Quick brown fox . . ." test key.

CONTINUED ON PAGE 13

CONTENTS-

DUAL MODE KEYBOARD - - - - -	1
WAEDC DX RTTY CONTEST - - - - -	2
UART - - - - -	3
RTTY COUNTER-PART 2 - - - - -	9
RTTY FOR BEGINNERS- PART 12 - - - - -	12
DX NEWS- HONOR ROLL - - - - -	14
MORE ON HEATH SCOPE - - - - -	16

WAEDC DX RTTY Contest - April 20-21

The Deutscher Amateur Radio Club (DARC) the sponsor of the RTTY WAEDC invite all amateurs to participate in the 6th RTTY WAE DX Contest.

One week earlier this year, the dates are - April 20,0001 GMT to 2400 GMT April 21.

RULES SAME AS LAST YEAR-See details in RTTY JOURNAL of APRIL 1973 or QST, Page 101, March 1974.

Everything's on the up and up---

The gas companies want more money - the truckers want more money, the auto companies and employees want more money, and guess what -- the RTTY JOURNAL needs more money -- Because the POST OFFICE wants and is getting more money. Effective with this issue, as you all know, the postage rates go from 8 to 10¢ -- 25% increase - who said the guide lines were 6%??

As the printing and postage expenses are about equal and comprise almost 90% of our costs we will have to get on the band wagon too. At the last postal increase -- 33% -- just a year or so ago we cut out one issue a year which worked out fine, however at the rate increases are coming we would soon be down to only several issues a year and

However----

The situation outside the United States, Canada and Mexico is another case. Since we have published the JOURNAL we have purposely kept the air mail rates to foreign countries at just about cost as a help in spreading information world wide to the few hams operating RTTY in these countries. This has changed now and with an explosion of RTTY stations around the world our foreign subscribers has multiplied ten fold. Under old rates a year's subscription took \$4.20 in air postage, with the new increase this jumps to \$5.20, almost the total cost of a subscription. We have nothing else to do except increase the cost of an air mail subscription to \$7. South American countries to \$6.00. Surface mail has

also out of subscribers and everything else.

So -- we have another idea to balance the budget. Starting immediately the price of classified ads will be a \$2.00 minimum for 30 words and 4¢ for each additional word. All ads now on hand and paid for will of course be honored at the old rate. The JOURNAL classified section usually pays off very well on ads and with today's inflation \$2.00 is still a bargain.

Last month - we ran 53 ads, an extra dollar each will just about cover the postage raise and the readers will still receive 10 issues and hopefully the advertisers will still have a good bargain at \$2. minimum. We will try it at least . . .

also gone up. For the time being we can absorb that increase and the subscription will still be \$3.50.

Several countries have individuals that receive a bulk shipment, via air, of a number of copies and then remail them locally. This saves considerable over the direct air rate and is faster than surface mail. Two of the parties furnishing this service are --

England - Arthur Owens, Gwenarth, 184 Hale Rd. Hale, Cheshire, England.

Scandinavian Countries - Eskil Hedetun, Erik Dahlbergagatan 70, S-252-40 Helsingborg, Sweden.

All increases are effective immediately but all paid subscriptions will be honored until expiration.

UART - -

IRVIN M. HOFF, W6FFC
and
HOWARD L. NURSE, W6LLO

We are happy to again publish a series of articles by Irvin Hoff, W6-FFC, one of RTT's most popular writers. The first article, UART, is in this issue. Due to space limits the drawings will be continued in the next issue and other articles on a variety of subjects will follow. The UART looks very interesting - read Irvin's article and get ready to build something.

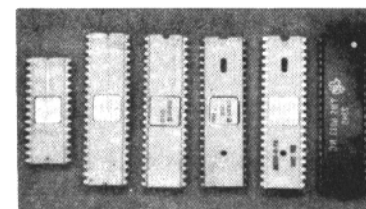
INTRODUCTION:

Through the years significant developments have occurred that have had important influence on the course of communications. Computers were made with vacuum tubes, but it was not until the introduction of the transistor that the field of communications really started to make gigantic strides. Medium-scale integration (MSI) has provided the integrated circuits that many of us are now using for such things as demodulators and Sel-cal units. Miniaturization has brought the development of the large scale integration chips (LSI) that many of you have seen in the solid-state time clocks. These chips have usually 40 pins and are said to replace around 25 of the MSI chips. Pocket calculators use these LSI chips, as do many of the newer types of small computers. Eventually the prices will come down to the point that everybody can afford his own household computer. As an example the linear op amp 709C was selling for \$30 in 1967, and now may be purchased for less than \$0.50 each at many small businesses catering to hams.

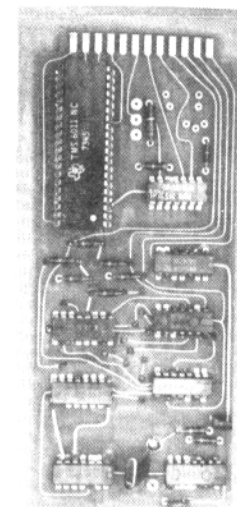
This article will deal with one of these multi-purpose LSI chips that has particular interest for anybody involved with computers or telecommunications, such as amateur RTTY operators.

WHAT IS THE UART?

The term "UART" stands for Universal Asynchronous Receiver Transmitter. You may also see it written as UAR/T. Data is usually transmitted in serial form, and if it has start-stop pulses added, it is called an "asynchronous" transmission.



Five different kinds of UARTs with one "FIFO" register at the end. The dark one is plastic, rest are ceramic..



Plug-in PC board with UART, XB-6 multiple speed clock, and ST-6 interface. By WA7ARI.

Computers on the other hand normally have shift registers that require parallel operation. As a result some type of device needs to be used to convert the serial input to parallel after stripping off the start and stop pulses, and then take the output from the computer and change it from parallel to serial, adding the necessary start and stop pulses.

The UART is a 40-pin, single monolithic technology. It takes the place of about 25 or so normal MSI

APRIL 1974 3

chips. It is called "universal" since nearly all of its functions are externally controlled. It can be used for 5, 6, 7 or 8 level date. (Baudot code that is used now on amateur RTTY is 5-level; ASCII code for computers is 8-level.) Selection can be made of 1-unit or 2-unit stop pulses or an external circuit can be added giving 1.42 units of stop pulse. The device samples the incoming signal for a valid start pulse and rejects those signals not having one. One terminal goes high if the character does not have the expected stop pulse. If desired, this can be connected directly to the master reset pin (21) and the entire character is then rejected. Many of the other pins give information of interest to computer operators such as parity error, status flags disconnect, parity inhibit, even parity enable, etc.

The UART was designed primarily for use with computer circuits but obviously was intended to be used wherever data needs to be received or transmitted. As a result some of the devices, such as the General Instrument Corp. AY-5-1013 are good for 40,000 Baud! Compare this with the amateur speed of 45.45 Baud for our 60-wpm speed!

HISTORY OF THE UART

The device is not particularly new. There will be some who will wonder why it is only now appearing to surface in the RTTY JOURNAL. Like other devices, it often takes time for somebody to actually apply it to the needs of amateurs. Since it was originally intended primarily for computer interfaces, production has been snapped up by large companies wishing to be competitive. It was this desire, in fact that led to the development of the UART.

The background of the UART is a bit hazy, but from what we can find, a small group of engineers split away from the parent General Instrument Corp. and founded a firm called "Solid State Data Sciences". They apparently received a contract from Digital Equipment Corp. (one of the larger computer manufacturers specializing in smaller computer sizes) to develop such a product. The firm went out of business in 1970 and DEC then turned over what SSDS had done to other firms interested in the further development of the device. By September 1971, three firms were advertising UART devices. The SSDS engineers for the most part went back to General Instruments (will be called "GI" in many places in this article for brevity), and thus GI has

claimed (probably with some merit) as to having been first on the market with the UART. The GI Corp. by the way is located in Hicksville, L.I., New York. On the west coast two firms introduced UARTS about that same time. The GI unit was called the AY-5-1012, the Western Digital Company of Newport Beach, Ga. called theirs the TR1402A and American Micro-Systems, Inc. (AMI) of Santa Clara (south of San Francisco) called theirs the S-1757.

By December 1971, all three firms were advertising in periodicals read by data engineers. Since that time each company has made updated versions of the original unit. The current list, plus the one made by Texas Instruments would be:

	AMI	S-1883
GI		AY-5-1013
TI		TMS-6011NC
	Western Digital	TR-1602B

PRICES:

The last two UART numbers listed are both plastic, such as the material used in nearly all of the IC's you have probably seen. The first two are believed to be available only in ceramic, which is more expensive. The GI unit is \$16 in unit quantity, the TI and Western Digital in plastic, \$11 each in unit quantity.

AVAILABILITY:

Even several years after their introduction, supply is often far exceeded by demand. In general the TI unit seems to be a "best buy" overall and should be the most readily available, as TI is handled by a great number of distributors. Here are the addresses of all four companies, if you wish to correspond with them regarding availability:

American Micro-Systems, Inc.
3800 Homestead Road
Santa Clara, Ca. 95051
General Instrument Corp.
600 West John Street
Hicksville, L.I., N.Y. 11802
Texas Instruments, Inc.
P.O. Box 5012
Dallas, Texas 75222
Western Digital Corp.
19242 Red Hill Ave.
Newport Beach, Ca. 92663

As few of these firms are really geared to individual mail orders, perhaps some enterprising dealer will buy up a good quantity and through getting them at dealer's cost be able to offer them to hams for \$1 handling and mailing beyond normal cost perhaps.

AMATEUR APPLICATIONS:

The most simple and one of the most useful applications of the UART would be as a regenerative repeater. These devices have long held an interest for the advanced enthusiast, and several articles have been written on using them on RTTY. More will be said on this application soon.

The UART is readily turned into a speed converter by merely adding a second clock. Thus the input can accept characters at 60 wpm, for instance, while changing them to 100 wpm characters for the output. As a result the machine may be left at 100 wpm, and all speeds including 100 may be copied by merely changing a switch on the incoming clock speed.

Since the UART converts the incoming signal to parallel, you also have the basic ingredients of an electronic stunt box, or the entire front end of a Sel-cal unit. Throughout all of these applications you retain the features of the basic regenerative repeater.

Used in conjunction with a Silo register (also called FIFO registers for First-in, First-out), you can have storage memory for down-converting. This will enable you to use the 100 wpm printer to transmit characters at 60 wpm without over-running and losing characters. This has been one of the most-discussed disadvantages with moderate-cost solid-state keyboards sold for amateur purposes. Thus the UART with two clocks and a Silo register becomes an attractive means of stimulating tape speed while typing on a fast, 100 wpm keyboard. The combination would also adapt readily to solid-state keyboards, although in that case you would normally need to add an ASCII-to-Baudot conversion chip as well.

The speed converter would appeal to people who like to copy higher speeds than 60 wpm. It has several advantages over a 3-speed gearshift on a model 28 teleprinter. An interesting speed converter using MSI chips that has many of the features of the UART was designed by Larry Laitinen WA6JYJ. At least two advanced enthusiasts are using that circuit in conjunction with large quantities of memory buffer -- Roger Amidon, Jr. K2SMM and Russell Pillsbury K2TXB. The UART chip plus two external clocks would take the place of the nine IC's used in the WA6JYJ speed converter.

Paul Satterlee, Jr. is using the UART and large memory buffer as an

up-converter, down-converter for his model 28KSR. One of the authors, W6LLO is using the UART with Silo chip plus a "diddle generator" that plays machine speed letters or figures if the memory buffer has nothing to send. The continuous output is similar to that pioneered by Jim Haynes W6JVE mechanically on his 28ASR.

WA6JYJ was also using the UART in a video computer display he built to monitor RTTY transmissions.

Bill Walters WA5PTR/7 has recently completed a station control system using the UART that is similar in action to the electronic stunt box previously mentioned. It decodes all 32 characters and with only a few IC's he is able to recognize any of a number of specific sequential characters to do various things such as trip off his answerback, ring a bell if his call letters are typed, print only those messages intended for his stations, etc.

These are but some of the applications already being used for the UART. John Lovci W6JFY uses one for transmitting in order to reduce his keyboard distortion to a negligible amount.

Other uses will come to mind as various enthusiasts become acquainted with this versatile LSI device.

BASICS OF OPERATION:

The UART needs about 10-12 mils of -12 VDC (minus twelve volts) and approximately 4-6 mils of plus five volts.

Due to the use of pull-up resistors on the inputs, if nothing is hooked to pin 20, the UART thinks it is receiving a mark signal. Grounding the input (pin 20) makes it think it is seeing a space signal. Thus a simple open-collector transistor or IC device across the input is all that is needed. This is illustrated on the schematic for hooking the unit to the ST-6, for instance. The output on pin 25 is also normally high for mark and low for space. The output is only able to pull a maximum of one mil or a bit more, so some discrete components are normally needed for the 3-4 mils the typical keying transistor needs.

THE RECEIVER SECTION:

The clock speed runs at 16 times the normal Baud rate. For usual 60 wpm (45.45 baud) this would be 727.3 Hz. Each pulse is then divided internally in 1/16th bits and used for internal timing purposes.

Whenever an initial reversal comes along that causes the input to go low,

the unit starts its counting. When 8 of these "mini-bits" have gone by, the level is sampled and if still low, the unit thinks it has seen a valid start pulse so accepts the rest of the character, sampling each pulse every 16 mini-bits later.

At the time the stop pulse is expected, the pulse will set the "framing error" flag (Pin 14) if no stop pulse is present. (a low instead of a high.) This pin 14 can be used to dump the entire character if the user so desires. In any event the UART is then free to immediately start checking for the next reversal. As a result, the UART only takes one mini-bit over 6.5 normal pulses before it can look for the next start pulse. Thus input signals with bad distortion can be readily sampled. Without going into the math involved, most companies claim signals with up to plus-minus 47-48 per cent bias can be handled with perfect output timing being generated in the transmit section.

Once the character has been accepted, it is stored in the receiver holding register while the next character is being received into the receiver shift register (two different registers). When the first character was complete, a flag is set telling the transmit section another character is ready for the first character prior to the completion of the second character the "over-run" flag (pin 15) is set. This might occur if using the unit as a down-converter and typing too rapidly. In this case the 2nd character will be lost. The transmitter can accept the first character and when it has been transferred, the receiver holding register can accept the second character, etc. The transmitter section will add a start pulse, stop pulse and put the entire character out in serial form, perfectly regenerated with less than 1 per cent bias. Thus incoming signals with great amounts of bias can be handled, and retransmitted at the same character interval with virtually zero bias, or transmitted at a faster Baud rate, again with no bias. While one character is being transmitted, the transmit section can load another character into the transmit holding register. This process enables very high Baud rates of interest to RTTY operators.

Since the characters are held momentarily in the various registers, you experience a most unusual "echo" effect if having two printers running from the same source simultaneously -- one with the UART and one without!

ADVANTAGES OF A REGENERATIVE REPEATER:

Numerous advantages exist from using a regenerative repeater. Many of these are subtle and would normally not be too evident, particularly in normal-to-good receiving conditions. For one thing, if you have a reperf on the same loop as the teleprinter, you are now assured that regardless of receiving conditions both machines will print identical copy. This is certainly not the case with badly distorted signals where the printer may decide the poor character was one letter and the reperf may decide it was a different letter. If reperfering messages, etc., this could be very embarrassing if the reperf had some errors not on the printer, or vice versa. It certainly makes it very simple to examine the reperf tape if you know the same copy will be on it as on the printer. This is perhaps the principal advantage of any regenerative repeater -- uniform copy. Also with the ability to copy up to 47-48 per cent bias, there should be a significantly fewer number of errors to start with in marginal copy. Even the best teleprinter would be very hard put to do that well, and even so would have to be adjusted exactly in the middle of its range. As a result, the worst possible teleprinter that could even print its own keyboard accurately would copy as well or better than the best of teleprinters in optimum adjustment, not using the regenerative repeater.

Since we try to improve copy by using better receivers with narrow i.f. filters, build better demodulators, keep the machine in good adjustment, then any device that practically guarantees superior results for low cost should be of immediate interest to the enthusiast. In marginal conditions also, many characters are distorted so badly they may not have a stop pulse. In this case the teleprinter is not stopped for that character normally, and can sail around waiting for the next stop pulse which it will expect 6.5 units later. This is not necessarily compatible with the transmitted signal coming in, and a missed stop pulse will often cause an entire word to be lost due to the machine "losing synchronization". The UART particularly is good in this environment as it always supplies the expected stop pulse. The UART may start the machine on a spacing pulse that was not really a start pulse, but there is no way for the teleprinter to get out of synchronization, since all

the characters fed to it are valid characters.

Other less important but interesting features are noticed as well. For instance if somebody diddles the break key to set their shift, normally your printer would run open whenever they go to space, or until the anti-space locks up at which time you invariably print an error due to the anti-space bringing the printer back to a mark pulse. With the UART, it will trip off one blank, and wait for the next transmission. As a result you print one blank character each time they diddle the space key, assuming they hold it down more than 1/6th second, the time for one normal character. The interesting thing occurs when requiring a valid stop pulse by connecting pins 14 and 21 instead of grounding 21. With the TI or GI UARTS, the unit sees no stop pulse, says that is no character, dumps the receiver shift register and as a result no characters are printed at all! Thus with somebody going from mark to space slowly, you would think you were locked into standby as you in effect are!

This feature is of some interest to people having the autostart turned off. Random garble will print maybe 30-40 per cent the number of characters normally printed.

Another perhaps minor advantage of the regenerative repeater comes from receiving signals off the frequency. Since distortion increases as the signal gets further to one side of the filters in the demodulator, the UART (or any other regenerative repeater) tends to continue printing properly longer than the typical printer could by itself.

Of course it goes without saying that such a device is quite beneficial to anybody retransmitting to another frequency, such as 2M repeaters, etc. At least all stations on the frequency ought to print the same identical copy.

The regenerative repeater also would be quite useful as an output device between a poor keyboard and the signal sent out over the air. Such a device can turn the poorest model 15 into a signal equal to the very best, or can take a model 14 TD with dirty contacts and have perfect output copy, assuming the contacts were not bad enough that nobody could print anything even with the repeater!

At least the device offers a tremendous improvement in ability to transmit and receive with marginal equipment, and should improve the copy to a noticeable extent on any teleprinter in marginal copy.

One of the authors W6FFC has been using a computer with video display since 1972. As it has electronic regeneration, it was at times quite evident this was an advantage as the video display would regularly have fewer errors than the 28ASR on the same loop output! Many times an entire word would be lost on the 28 that could easily be deciphered with maybe one error on the screen. It was this "revelation" in fact that led to immediate interest in the UART when W6LLO first started experimenting with the device.

DIFFERENCES IN VARIOUS UARTS:

The authors have used practically every UART available. This includes the AMI S-1757 and S-1883; the GI AY-5-1012 and AY-5-1013; the TI TMS-6011NC and the Western Digital 1402A and 1602B. Certain differences become evident. In general we liked the GI AY-5-1013 the best as it was the most convenient to use, but is also probably the most expensive at \$16. It is not available in plastic. The Western Digital 1602B offer the interesting possibility of a choice between a 1.0 unit or 1.5 unit stop pulse when using 5-level Baudot output. All the rest offer the same 1.0 or 2.0 for any level code. The WD at \$11 is a good buy, but has one very minor but possibly annoying feature -- in simple use as a regenerative repeater or speed converter, if the operator does not desire the stop pulse requirement and grounds the master reset, the WD unit unlike any of the others will latch up and become inoperative any time the voltages are applied, if brought up backwards, with the plus five volts ahead of the minus 12 volts. There is a simple cure for this, you momentarily open pin 21 and let it go high for a moment and then ground it, or use a pulse delay so that pin 21 stays high for a bit insuring the negative 12 volts is applied before pin 21 goes low. If on the other hand you normally wish to require a stop pulse by having 14 connected to 21, this latchup can never occur. The WD has one other interesting feature -- if requiring the stop pulse and somebody slowly diddles the break key, it will still trip off a blank character but only on the transition back from space to mark. This is considered too insignificant to be of any importance whatsoever, but is mentioned.

Both the AMI and the older GI unit (the 1012) will latch up if requiring the stop bit rather than grounding pin 21. A simple one-shot will easily take

care of this, but it is not necessary with the new GI, or with the TI or WD. Thus we would feel those latter three to have an important advantage over the rest. The GI units both have slightly different internal timing, so you do not connect pin 18 to 22 as on the other units. Finally, the TI has one slight idiosyncrasy of its own that requires an inverter hooked between pins 19 and 23, with the input of the inverter going to 19 and the output to pin 23. This is considered to be only a very minor nuisance insofar as you will have extra inverter stages in the interface anyway. For instance in hooking the UART to the ST-6, a 7406 hex buffer is used, and there will be several of these sections remaining.

In this case, one of the unused sections would be pins 8 and 9 of the 7406. The output (8) would go to pin 23 and the input (9) would go to pin 19.

To summarize this section, the GI AY-5-1013 is the easiest to use of all but is also the most expensive. The TI should be the easiest to obtain in unit quantities and with the inverter between pins 19 and 23 it appears to be a "best buy". The WD units have a minor latch up possibly but otherwise are completely satisfactory, and an acceptable yet fairly simply solution to the latch-up is shown in the accompanying charts.

CONNECTING THE UART:

The specification sheets should be obtained if you wish to really study the action of each of the pins. The figure called USING THE UART shows most of the connections. The pins with diagonal lines are connections to transmit the character from the receiver section to the transmitter section, and all 8 levels are connected in this illustration. 13 is parity error, 14 is framing error (no stop pulse), 15 is overrun error, 17 is receiver section clock speed, 18 is data received reset, 19 is data received, 20 is the input to the receiver section, 21 the master reset, 22 transmitter input holding register empty, 23 transmitter input word strobe, 24 transmitter end of character flag, 25 transmit section output, 34 control strobe for transmit mode, 35 parity inhibit, 36 stop bit selection (open for 2-units, grounded for 1 unit), 37-38 select character length (shown for 5-level Baudot), 39 Even parity enable, and 40 is the transmit section clock speed.

This very brief summary of the pins themselves will most likely be

adequate for most people, others will wish to get the data sheets, which are extensive.

ONE OTHER UART:

The Signetics MOS catalog for two years announced a UART they were planning to call the 2536. This chip was never produced, and the project has been abandoned. Motorola has two separate chips as did TI several years ago.

DRAWINGS:

Several drawings have been prepared. One shows the UART hooked as a regenerative repeater, using a NE-555 clock. One shows the UART used as a transmit device. Another shows how it may be interfaced with the TT/L and another shows how it may be used with the ST-5 or ST-6. Finally a circuit is shown for a crystal synthesizer that gives any of a variety of standard Baud rates all from one low-cost crystal. The latter will be presented as a separate article.

On the NE-555 clock, a Sprague orange drop capacitor kept the frequency from about 726-733 over a week's time. A Centralab 10,000 Pf. polystyrene capacitor seems to be holding from 727-729 Hz., which of course is excellent. Even the previous figures represent only a 1 per cent change, an insignificant amount.

SETTING THE STOP PULSE:

Set the stop pulse on 1.0 units and forget about it. This would allow reception of signals running as fast as 7.0 unit code, while if set for 2.0 units stop pulse, you would overrun quite frequently at normal tape input speed and drop characters. If using it for transmitting, the keyboard or TD would still control the number of characters transmitted per minute, so everything is still ok.

PULL-UP RESISTORS:

All of the UART devices mentioned with the exception of the somewhat obsolete AMIS-1757 have internal pull-up resistors and are diode-protected against negative-going input voltages. They also have tri-state output levels. As a result control bits not needed may be left with no connection.

ACKNOWLEDGEMENTS:

A number of people have been most helpful and interested in this project. One of those has certainly been WA5IAT whose valuable information with re-

spect to the TI unit was appreciated. Others contributing ideas and comments have been WB6WPX, W6OXP, W6JFY (whose help with the GI unit was of value), WA5PTR/7 and WA7ARI.

FOOTNOTES:

1. The TT-63/A Repeater by Irvin M.

RTTY COUNTER

BERT KELLEY, K4EEU
2307 S. Clark Ave.
TAMPA, FL. 33609

Part II

The response to the small counter in the October 1973 Journal has shown that many RTTY enthusiasts are interested in building their own counter. Most planned to build the eight digit instrument. They will be helped by additional material and boards that were sent out. These added notes are to assist in construction and show what an eight digit instrument looks like.

It is practical to build your own counter if you have the interest, a few tools, and the time to do careful soldering work. It is important to select a good design because of the stake in effort and money involved and because the finished product can not be expected to work any better than the original. This is a good design which has been selected from the pages of QST and Ham Radio magazines. The result is about the simplest front end and power supply possible, a scaler with excellent performance, and a bright non-blinking readout. It also has an unusually wide frequency range of from audio to at least 180 mhz.

INPUT CIRCUIT

The input circuit, shown in Figure 1, uses two transistors in a source follower, emitter follower combination to transform the high input impedance down to a value suitable to drive TTL logic. The .01 mfd is a DC blocking capacitor and the 1K resistor is used to limit the input current since the back-to-back diodes conduct for any AC input that exceeds about 1.5V P-P. At low input levels the diodes do not conduct and the input impedance is very high. Above about 1.5V the impedance drops to about 1K, so for extremely high level signals some means should be used to reduce them to a reasonable value. For audio this would be a 100K resistor and for RFA a small variable capacitor. If the input is grossly overloaded, the worst that can happen is the 1K resistor

Hoff, K8DKC (now W6FFC), RTTY, April 1964 Pg. 3

2. An IC Regenerative Repeater by J. A. McElvenney, 7Q7JO, RTTY JOURNAL, July-August 1970, Pg. 3
3. Electronic Teleprinter Speed Conversion by Laurence H. Laitinen, WA6JYJ, March 1971, Pg. 3.



might burn out, or a diode short--either of which can be replaced for a few cents.

TIME BASE

The frequency standard used as the time base has been adequately covered in my recent article in Ham Radio magazine (1) so this will not be repeated here. It is important to have a good time base standard since the counter accuracy is directly dependent on this. So use a good standard with a good crystal. The circuit board set includes a simple time base that is derived from the power line. This is intended to be

used only for testing purposes or for counting audio.

Fig 2 shows counter interconnections. It also shows how a combination counter and frequency standard may be constructed and derive maximum use from the precision crystal. The under chassis photograph shows the frequency standard mounted directly under the time base selector switch, positioned so the oscillator is near the piston trimmer.

THE SCALER

This is shown in Fig. 3. It costs only \$20 to build and extends the range of the basic instrument up to at least 180 mhz. The sensitivity is such that with a short antenna plugged into the panel jack, hand held or mobile transmitters can be measured that are anywhere in the reasonable vicinity.

This scaler circuit is not particularly critical but the range can be extended or optimized with a few minutes work. The top scaler frequency can be no better than ten times the top frequency of the counter which is specified to 18 mhz. I used a socket

for the 7490 that counts units (connected to the 7400 gate) and selected an IC that would count to 30 mhz. There is a difference between different brands and while all will count to 18 mhz, some will go beyond this point. Texas Instruments and Motorola seemed to be better in this respect but you may find another make works equally well. The point is to select the best chip from your junk box or by interchanging it with others in the counter. None of the other counter 7490's are critical since they operate at greatly reduced frequencies. The scaler will multiply the basic frequency range by ten up to a limit, so if you want your scaler to go up to 200 mhz for example, you must select a 7490 that will count to at least 20 mhz. My counter goes to 250 mhz, another model to 225 mhz. If you are satisfied with 180 mhz top range, it is not necessary to select 7490's. The performance of the scaler can also be optimized by experimenting with small changes in bias on pin 1 of the 95H90 and the turns spacing of the air wound coil.

The low pass filter suggested by

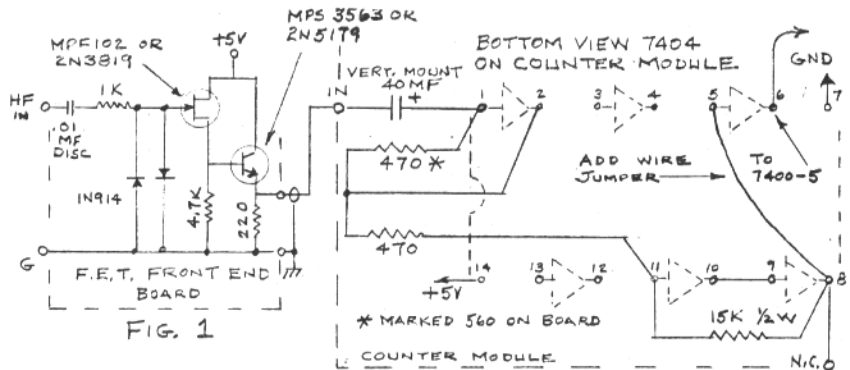
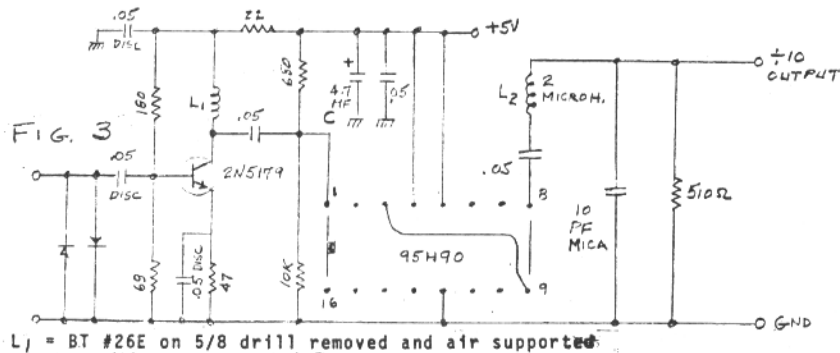


FIG. 1



L₁ = BT #26E on 5/8 drill removed and air supported
 L₂ = JW Miller #4604, or #30E wound on 1Meg.1/2 wt resistor
 C = 1 to 10mfd Tantalum

W6MGI improves operation. The 2 microhenry coil is not critical in value, and a suggested substitute is given. A source for the scaler chip and high frequency transistor and a picture showing assembly is given with the board. Note

that this board is not available separately.

POWER SUPPLY

The power supply consists of a filter and three regulators which supply dif-

ferent voltages. CONTINUED ON PAGE 16

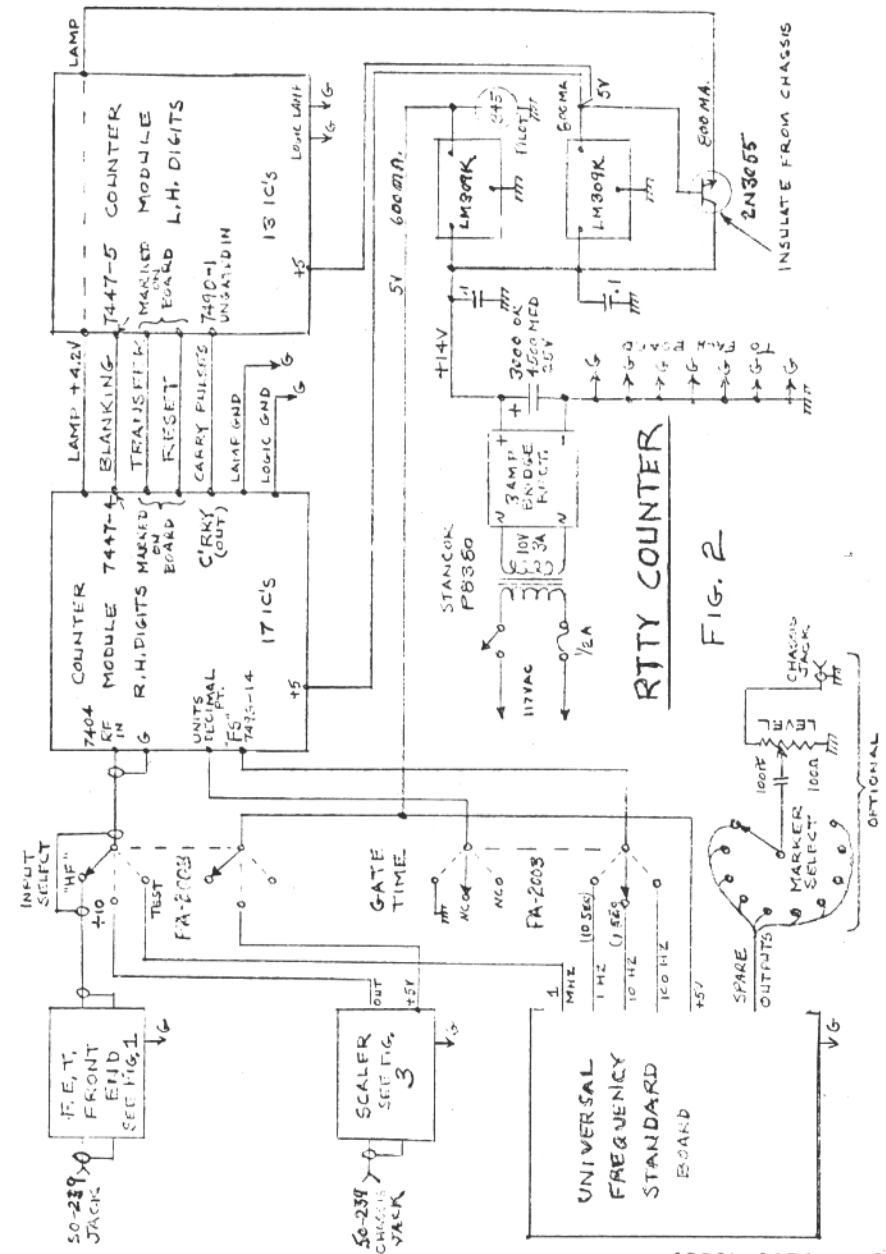


FIG. 2

RTTY theory & applications.

RON 'RG' GUENTZLER, W8BBB
Route 1 Box 30
ADA OHIO, 45810



RTTY for Beginners- Part 12

LOOP SUPPLIES AND KEYING VOLTAGES

For the last two months we have been discussing methods of keying a transmitter. In what was called Arrangement #2, it was necessary to obtain from a loop the voltages used to operate the keyer (FSK or AFSK). This month, we will discuss the circuit used in such units as the TT/L-2, ST-5, and ST-6 to obtain (or provide) the necessary keying voltages. We will also discuss loop power supplies in general in order to define the requirements for a loop supply and we will give a typical circuit for a loop supply.

LOOP SUPPLIES

The basic requirement for a loop supply is 130 to 260 volts dc. It must be capable of continuously supplying that voltage at 60 mA. There is no real upper or lower limit to the supply voltage. Below 130 V, time constants in the loop might become troublesome. Above 260 volts, the voltages start becoming rather hazardous. (Even 130 volts can be lethal, but the danger increases as the voltage increases.) "Real" telegraph loops usually work at 260 volts.

The reason that the voltage, per se, is not too important is that the loop is made to operate at a specific current, usually 60 mA. Therefore, once the supply is built and operating, you place resistance in series with the loop to set the current at the desired level. The higher the voltage, the higher the resistance required and the more power "wasted" in the series resistance. However, because of time constant problems, the more power wasted in the resistance, the better the loop characteristics! (See RTTY Journal, 1967 DEC, pp. 8-9,13; 1968 JAN, pp. 10-13, 16-17.)

If you have more than one loop, you can use two different approaches to supplying them.

1) Build a separate power supply for each loop, or 2) Build one supply that is large enough to handle all loops at once. The advantage to several "small" loop supplies is that they can be

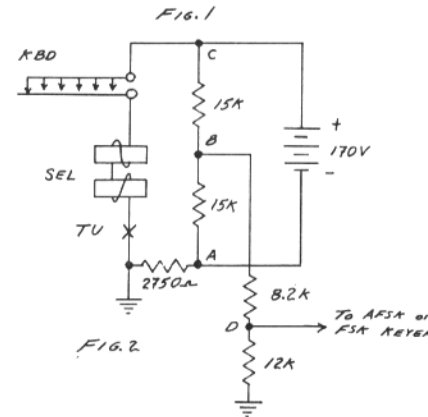
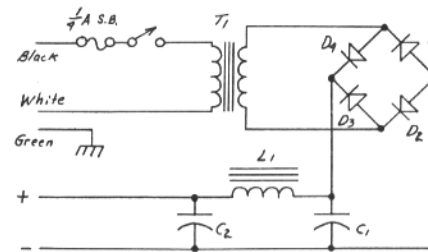
"floated" (isolated or not grounded) and this can be used to advantage for keying other loops, etc. (to be described later). The approach used here was to build one big supply (130 V, 1 A), ground the negative terminal, and run whatever is desired from it.

If you intend to build a TU such as the ST-5 or ST-6, you can buy the power supply components for it now and build a loop supply. Later, you can cannibalize it and reuse the parts in the complete TU. This is a very economical approach. (For the ST-5 power supply see: RTTY J., 1970 MAY p. 7; for the ST-6: RTTY J., 1970 SEP, p. 11.)

If you want to build one from scratch, you might try the circuit shown in Figure 1. Basically, it is a simple full-wave rectified supply with capacitor input filtering. The transformer is a simple "isolation" transformer. The advantage of using an isolation transformer is that it can always be used for its original purpose if you no longer want it for a loop supply. Suitable type numbers are: Allied 6K112HF, 6K38VCP; Essex (Stancor) P-6410; Triad N-51X, N-68X. These are all 35 or 50 VA transformers. Many are available in higher power (VA) ratings.

For the rectifiers, the old standby 1N4005 is an excellent choice. If you want a bridge assembly (all four diodes in one blob), try the Motorola HEP177 (280 Vrms, 1A), Mallory FW-600 (600 PRV, 2A), or the International Rectifier 18DB4A (282 Vrms, 1.8A). These packages are in the \$2 price range.

If you use one of the transformers listed (or a higher VA rating transformer), you should use capacitor-input filtering as shown. For the input capacitor, C1, try 20 uF or higher at 200 or 250 Vdc. The capacitor size will control the output voltage. For the output filter, C2, use something in the 500 uF range, or higher. We have used the Mallory HC20005 (500 uF, 200 V). The Sprague 142F200BC (1400 uF, 200 V) will work nicely.



AFSK) is operated from this loop.

The means of obtaining the keying voltage from the loop is shown in Figure 2. A 170 volt dc power supply is connected in series with the keyboard, the selector magnets, the output device in the TU (indicated by an X), and a current limiting resistor (2750 ohms). When the loop is closed (Mark), point C is nearly at ground potential and point A is at about -170 volts. The midpoint of the two 15K resistors, point B, is at about -60 volts, and point D is at about -40 volts. When the loop is opened (Space) by either opening the keyboard contacts or by the TU, point A is at nearly ground potential and point C is at about plus 170 volts. Therefore, point B is at plus 60 volts, and point D is at about plus 40 volts.

The -40 volts at point D during Mark and the plus 40 volts at point D during a Space is supplied to the keyer (for example, the FSK keyer given last month in Figure 2) and the keyer thus keys according to the Marks and Spaces in the loop.

Dual Mode Keyboard-

CONTINUED FROM PAGE 1

In the CW mode, you can send at speeds anywhere between 8 WPM and 60 WPM. You can also adjust dot-to-space ratios to your liking. You have all alphanumeric keys, plus 11 punctuation marks, 5 standard double-character keys, 2 shift keys, a break-for-tuning key, error key, a "DE call letter" key, plus 2 three-character function keys. Output interfacing is compatible with cathode keying or grid-block keying. A side tone oscillator and built-in speaker allow you to monitor your signal -- with adjustable volume and pitch controls.

Key function logic in either mode is governed by LSI/MOS circuitry. All key switches are computer grade. A three-character buffer memory works in both modes, making it virtually impossible to type ahead of the keyboard at any speed, and an optional 64 or 128 character buffer memory is available.

The DKB-2010 is available assembled or in kit form.

Prices are \$425 for the assembled unit, or \$325 for the kit unit with shipping postpaid in the U.S.A. The 64/128 character buffer memory is available at extra cost. From HAL Communications Corp., Box 365, Urbana, IL 61801. Phone 217/359-7373.

RTTY-DX

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



Hello there . . .

Anyone having written articles for publication well knows that as the deadline draws near one goes into the "sweaty palm" and "tight feeling in the pit of the stomach" syndrome wondering whether you are really going to have anything to write about. Well, this month there seems to be an over abundance of info to pass along and if we expect to get it all in the space allotted we had better stop talking and get on with it.

Early in February a really rare station in any mode made what was apparently a brief appearance on RTTY. This was XV5AC located in Saigon. He was calling CQ "W" at about 1500z with no takers but he was solid copy in South America and Europe at that time and many of the boys have this rare one in the log. QSL cards can go via his manager, who is W1YRC at

Robert Beaudet
 30 Rock Crest Rd.
 Cumberland, R.I. 02864

At about the same time there was some rumored activity from 9M2IR. This possibility had been mentioned some months ago and we hope that the rumors are well founded and that we can pass along more detailed info in the near future. The operator at 9M2IR would be "Big John" Van Lear, an old hand at Far East amateur activity. John is located in Johore, Malaysia.

Reports continue to arrive on the activity of Katu, JD1AGZ, Marcus Island. While his signal apparently has not arrived as yet in the Eastern part of the States he seems to be good copy on the West Coast, usually around 2300z. Be you so fortunate as to contact Katu you can QSL via his manager who is JA10GE. . . .

Keigo Izumi
 Takane-Danchi 346 203
 Takanedai, Funabashi
 Chiba, Japan

And now Bonin . . . JD1ABH will set up the end of the month for about a one year stay. More about this later.

In about two months Wolf, EP2WB will return to Germany (DL2WB). Many thanks to Wolf for giving most of us a

HONOR ROLL-100 DXCC

Nr. 1	ON4BX	128 Conf.
Nr. 2	W3KV	127 Conf.
Nr. 4	ON4CK	123 Conf.
Nr. 5	W5QCH	111 Conf.
Nr. 7	WA3IKK	108 Conf.
Nr. 6	W8CQ	104 Conf.
Nr. 12	I5ROL	104 Conf.
Nr. 11	W2LFL	103 Conf.
Nr. 10	G6JF	101 Conf.
Nr. 3	I5KG	100 Conf.
Nr. 8	DK3CU	100 Conf.
Nr. 9	W5EUN	100 Conf.
Nr. 13	W4YG	100 Conf.

50 or Over Confirmed

W3DJZ	107/98	LU2ESB	87/65
ZS3B	103/94	W2PLQ	70/65
K8YEK	98/94	I1WT	71/64
JA1ACB	96/92	OK1MP	68/62
K6WZ	90/83	ZL2ALW	63/58
W1GKJ	84/79	K4VDM	62/58
WA2YVK	90/75	K6YUI	64/55
W4CQI	88/75	KH6AG	73/53
W4EGY	82/74	CE3EX	60/53
DJ8BT	78/74	SM0OY	59/53
W8JIN	78/70	SM5BO	60/52
F9RC	76/68	W0HAH	62/51
DL8VX	75/68	W0MT	56/50
		K3SWZ	53/50

Under 50 Confirmed

XE1YJ	58/49	VP2KH	56/34
EI5BH	53/45	ON5CZ	60/31
W5TZZ	51/44	SM6EZZ	35/30
F5JA	55/43	W7BCT	41/29
W8CAT	45/43	HB9ACQ	40/29
HB9HK	56/42	W2IDX	50/28
9Y4VU	48/42	DJ0RR	49/28
WA6TLA	48/42	DL0AK	49/28
W9BT	45/41	I6NO	60/25
I5CLC	61/40	PY6HL	33/23
K2CY	56/40	PA0WDW	39/20
EA7PZ	55/40	W4ZLH	29/14
HB9AKA	48/36	W5RYA	15/12

new country over the past two years. He was recently in Africa at the QTH of FL80M but, unfortunately, sans RTTY. We may very well hear Wolf from a new and rare DX location sometime in the future as he really gets around this world.

Come the Ides of March Sid, VP2MKH, may very well be a semi-permanent resident of Monserrat as the go ahead has been given to the project Sid will supervise. We would also have you know that among his many talents Sid blows, squeezes, and plays a mean bag pipe, complete with Highland regalia. He is also a connoisseur of "Haggis" and you must ask him how this delicacy is prepared next time you chat with him.

Belize is becoming quite popular on RTTY. In addition to Mike, VP1MT, as was mentioned last month there is now activity from Jim Graham, VP1DW and Jim Rayment, VP1JR and all can receive QSL's at

Airport Camp
 Belize, Central America.

Belize is not a misprint in this instance, altho we are guilty of many. We are given to understand that what was formerly British Honduras has now been given an independent status by the UK similar to many of the islands in the Caribbean. The boys are in the military and will be there for varying lengths of time so you had better hook them while you can.

HP1AH has been putting a real fb signal from Panama in recent weeks. Bernie is at the French Embassy in Panama City and prior to that spent many years in New York City and Montreal. QSL to him at

Apartado Postal 869
 Panama 1

Republic of Panama

There has been renewed activity recently from Miguel, CO2HZ, with excellent narrow shift signals. Miguel says to QSL to P.O. Box 1, Habana, Cuba. This is the Cuban QSL bureau so you can expect yours via the same route. He does QSL, as we have seen his cards, it just might take a while.

A bit further to the south Bernardo, HC1DL, has been putting in one of his quite rare appearances lately. In case you missed it last time his QTH is . . .

Bernardo Diaz Lyon
 P.O. Box 289

Quito, Ecuador.

Jeff, PZ1DJ, is temporarily QRT with a broken gear on his keyboard. He would appreciate any help in finding a replacement. The machine is a Lorentz Model 15-C and the gear is the pinion that drives the keyboard from the main shaft.

His QTH appeared here a couple of issues back.

Looking for Sardinia? IS0EP has been active with a fb signal recently.

It is not too often that you find a OM/XYL team on RTTY but of I0MPF/I0MVK, the distaff side is Anna, I0MPF.

Should you happen to be in Italy on June 1-2 of this year you possibly would like to attend the 7th RTTY National Meeting sponsored by the A.R.I. The setting is the Ariston Hotel, at Lido di Camaiore, which is right on the Mediterranean and not far from Pisa. All visitors are welcome and it has always been a well attended function so you will have the opportunity to meet many of the Italian RTTY gang. Lamberto Rossi, I5ROL can give you more info at P.O. Box 50, 56021 Cascina (Pisa).

From Africa Gary, CN8BO has been active and Mike, TU2DD, is back in Ivory Coast after a few months in France.

We understand that FR7AB is still active but, as always, on 15 meters only. Roland has been quite active there for a while but not too much heard from him in a year or so.

Roland Nativel
 9 Champs Fleurie
 St. Denis, Reunion Is.

Latest addition to the 100 DXCC - RTTY Club is

Nr. 13 Edward W. McGinley W4YG

We all certainly congratulate Mac for the FB job done in winning the Award and there is not many a pile-up that occurs, whether it be for a new country or in a Contest that you do not find Mac right in the midst of it. Most fellows would rather not be pinned with Nr. 13 but it must be the right number for Mac, note his winning of TWO Awards in the CARTG Lucky 13th! He recently retired from government service and is presently recovering from a rather delicate eye operation. We all wish him a rapid and successful recovery. Mac may also trade his 4 call for a 7 call in the near future. Then he will be able to start the whole thing over again.

As you know, additional endorsements are awarded for each additional ten countries confirmed and at this time we extend congratulations to Charlie, W5QCH upon receiving the "110" plate with 111 confirmed and to Bob, ON4CK, who receives a "120" plate with 123 confirmed.

The Grand Cayman DXpedition was about to occur at the time of this writing so we hope to have a report on that activity next month.

By the time you receive this the

CONTINUED ON PAGE 20

RTTY Counter--

CONTINUED FROM PAGE 11

ferent sections of the counter. The Numitron readouts should operate at less than 5V to reduce the current and extend the life to the rated 100,000 hours. Use silicon grease between the regulators and the chassis to help transfer the heat and space them apart on the apron of the chassis. There is less heat wasted in the regulators with the nominal 10V power transformer suggested, but 12V transformer could be used if necessary. There seems to be some difficulty with some "LM 309K" regulators sold in surplus, in that they will not deliver the rated 5V or will not tolerate capacitive loads. An authentic LM309K will maintain regulation at loads bypassed according to good TTL engineering practice. Those that will not should be considered defective.

CABINET CONSTRUCTION

It is necessary to use a metal enclosure to prevent hum pickup. The Bud CU-7128 is attractive, has a reasonable price, and is the right size. No standard chassis will exactly fit the space between the panels, but a 8 X 10 can be used by cutting off the long side as shown in the bottom view. This gives additional space for the controls and panel jacks. A handle is added to the top of the box. The readouts are viewed through a 9 1/2" X 1 1/8" opening sawed 1" below the top of the panel. The chassis is then located so the Numitrons are centered in this opening.

CONCLUSION

More information on the circuits selected can be found in the references. Since almost all the circuitry is on printed circuit boards, most of the labor in building this counter is in fabricating the boards. Boards are available to help in construction. These are epoxy, plated, but undrilled. The set includes two counter modules, a 60 hz time base, a front end board, a power supply bridge, and a scaler, \$10 postpaid in US and Canada, only. The suggested frequency standard board is \$8 additional.

REFERENCES:

Universal Frequency Standard, Ham Radio, February 1974 page 40
Frequency Counter for the Amateur Station, QST, Macleish, October 1970 page 15

Scaler, Emerson, Ham Radio magazine, September 1972 page 41, and October 1973, page 30. See also February 1973 page 57.
Low Cost RTTY Counter, October 1973 RTTY Journal

MORE on HEATH SCOPE

MELVIN LEIBOWITZ, W3KET

I note with interest the article in the March issue regarding the use of the Heath HO-10 and SB610 Monitor Scopes for RTTY.

There is a much simpler solution to the problem.

The horizontal amplifier has enough gain to produce a suitable sized pattern. The vertical amplifier does not.

Inspection of the specifications and circuit of the HO-10 reveals that the input resistance of the vertical amplifier is only 50 K ohms. This loads the one megohm output of the ST-5 or ST-6 to such an extent that the pattern size is greatly reduced. Thus it is only necessary to change the vertical gain control (R#3) to one of 2 megohms, to achieve the necessary gain and pattern size in this channel.

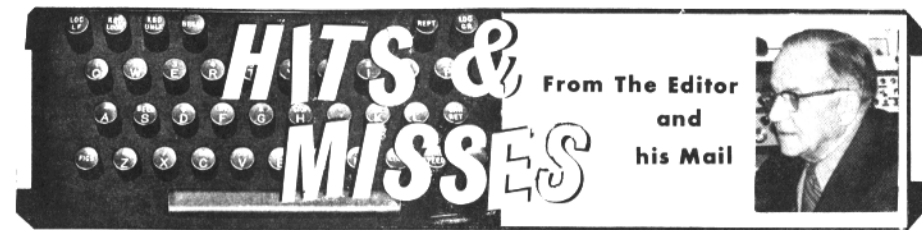
Users of the ST-5 can reduce the value of the 1 megohm isolating resistors to as low as 10K ohms without suffering ill effects but I do not suggest this approach to the ST6 as the 170 shift board and 850 shift board are connected in parallel to the scope connections through the 1 meg isolating resistors and a reduction of the values here would reduce the isolation between the two circuit boards with possible deleterious effects.

I have not actually tried this on the SB610 as I have the HO-10 but an inspection of the schematic and specifications for the SB610 indicate that it (either approach) would work on this unit also.

RESULTS- 1973 VOLTA Contest

1 W1GKJ	14,574.120	13 W9AE	2,552.664
2 WA2YVK	9,491.580	14 I5WT	2,345.938
3 I1BAY	9,298.900	15 W7BCT	2,199.582
4 KH6AG	8,895.150	16 HG5A	2,137.424
5 VE7UBC	7,094.784	17 IQZAN	2,118.880
6 IT9ZWS	6,878.340	18 PAQGKO	1,819.584
7 K6WZ	6,634.992	19 DK3MG	1,803.632
8 VK6PG	4,725.666	20 AQSCH	1,543.010
9 ON5WG	4,336.696	21 AX5IF	1,483.944
10 VK2KM	4,163.256	22 I5CW	1,335.360
11 I6NO	3,164.886	23 HB9AVK	1,245.564
12 WQHAH	2,896.137	24 WQMT	1,220.488

CONTINUED ON NEXT PAGE



Would a clearing house - no profit - help in getting some of the old machines in action? Mack Santer, W2ZPW, 2114 83rd St. Brooklyn, N.Y. 11214 believes it would and is willing to do the ground work and act as a clearing house. Mack has just been through the job of finding a machine and getting on the air and is willing to help others. Unfortunately many owners of older machines sitting around the basement do not read the Journal and Mack is interested in getting the ARRL to publicize his clearing house idea. If you are in favor of the idea or have other thoughts along this line write to Mack - not us. We are happy to publicize the idea and cooperate but time will not permit our organizing or running the organization. This is a case where we are all for it if somebody else does the work and we know Mack would do a good job. Write him ---

Contest Results--

25 DL1VR	1,017.759	46 SM7FGD	125.664
26 DK2XV	1,016.256	47 I3CKN	120.456
27 HB9HK	964.260	48 SL5AR	109.060
28 I1PXC	926.250	49 SM5CLW	105.560
29 VE4SC	668.304	50 OZ7RD	103.296
30 CE3EX	625.575	51 JA1EUL	105.127
31 OE5OEL	605.200	52 K7BVT	77.469
32 W7RGL	506.345	53 DL8QP	67.200
33 VK3KF	500.192	54 YU2RWR	57.950
34 SM5BVF	469.710	55 W2VAQ	36.036
35 OK1MP	439.824	56 OK2BFS	29.250
26 LX1JW	367.605	57 WA5LJZ	26.730
37 VE5TO	360.360	58 G3RDG	25.992
38 SM6E2D	357.975	59 VO1EE	22.275
39 YU2CAL	336.072	60 OK2BJT	16.038
40 VE2SR	310.068	61 W6AEE	9.108
41 G3OUR/A	256.476	62 W8CAT	6.804
42 PY2CYK	214.560	63 W2DUS	6.600
43 SM6AEN	211.926	64 SM6EDH	4.225
44 W7C8Y	155.208	65 K2RYI	2.214
45 UB5SR	135.720	66 W8TCC	1.338

S.W.L.

1 NL 687	10,912.290
Peter Boer	
2 Pauk Menadier	5,651.280
3 Larry Filby	3,984.300
K1LPS/18	
4 Roberto Giannello	2,893.124
i3-13.018	
5 Alberto Marchesini	1,111.968
6 Gerard Regard	694.666
FE 12-14	

Coming Up - April 25-27, Dayton Hamvention. A must if you can make it. See us at the Imperial North Motel - South Room. . .

BACK ISSUES

New subscriptions and classified ads are cash in advance as we have no method for billing. New subscriptions will be started with the current issue and one back issue, if requested. Please do not ask us to start any further back than this. Back issues - if available - may be ordered at 30¢ each at time of subscription. The JOURNAL is mailed about the 20th of the month preceding the dated month. May and June are a combined issue and July-August is a combined issue.

The ONLY back issues available are listed below. 30¢ each.

1966--Oct.-Nov.-	[2]
1969--Oct.-Nov.-	[2]-
1971-- May-June-July-Sept.	
Nov.-Dec.-	[6]
1972-- Feb.-Apr.-May.-July	
Sept.-Oct.-Nov.-Dec.-	[8]
1973-- Complete-	[10]
1974-- Jan.-Feb.-Mar.-	[3]

RTTY JOURNAL

Box 837

Royal Oak, Mich. 48068

Editor & Publisher 'Dusty' Dunn, W8CQ

SUBSCRIPTION RATES

U.S. Canada- Mexico	1st Class	\$3.00
	Air Mail	\$3.50
Other Countries	Surface Mail	\$3.50
AirMail South-Central America		\$6.00
Air Mail	All Other Countries	\$7.00

CLASSIFIED ADS- 30 words \$2. Additional words- 4¢ ea.

Cash with copy, Deadline 1st of month.

MORE RTTY! ONLY HAM RADIO MAGAZINE consistently brings you more RTTY articles and better RTTY articles than any other general amateur magazine. You need RTTY Journal, but you need HAM RADIO also. \$7.00 per year, \$14.00 for 3 years. Ham Radio, Greenville, NH 03048.

FOR SALE OR ??; Model 15 with table. Also new typing unit (extra). W9MDG, 4975 N. Hopkins, Milwaukee, Wisc. 53209.

FOR SALE; Model 28ASR w/LXD, ASR w/LCXD, stunt boxes coded. P. Anderson, 2448 N. Wilson, Royal Oak, MI. 48073.

BACK ISSUES OF RTTY JOURNAL - I have a complete file of all issues from Vol. 1 No. 1 to date. Will reproduce any issue for \$1.10 pp. Add 25¢ for air mail delivery. John Isaacs, 3175 Val Verde Ave., Long Beach, CA. 90808.

NEWS-NEWS-NEWS - Amateur Radio's Newspaper, "Worldradio", Trial subscription - Two issues for one dollar. "Worldradio", 2509-F Donner Way, Sacramento, Calif. 95818.

COLLECTOR wants back issues of RTTY Journal before 1969. W6ISQ, 82 Belbrook Way, Atherton, Cal. 94025

METRIC SYSTEM EXPLAINED, 500 Physical Measurements Converted. Booklet \$2.00 H. Morgan, 883 Diana, Akron, Ohio 44307.

HAL COMMUNICATIONS CORP.: HEADQUARTERS for MAINLINE Solid State RTTY Equipment. In demodulators, choose from the incomparable ST-6 or, for a low cost beginning in RTTY, the ST-5. Tailor or either to your requirements by selecting the 425 Hz press discriminator, the AK-1 AFSK oscillator, and tube or rack mount cabinets for the ST-6, or the AK-1 AFSK and the ST-5/AS autostart for the ST-5. Full details available in our current catalog. Charge your purchase to your BankAmericard or Mastercharge account. Everything is going up, but our prices haven't changed in 2 years, so act now. HAL Communications Corp., Box 365RJ, Urbana, IL 61801. Phone 217-359-7373.

CIRCUIT BOARD SET for "Low Cost Rtty Counter" Oct 73 Journal. Includes two counter modules, FET front end, 60 Hz time base, and a bonus scaler board. Scaler will operate to at least 220 mhz. Boards are G-10 epoxy, plated, undrilled, with full size photos showing each assembly. Necessary info included. Set \$10 postpaid in US., add \$8 for Universal Frequency Standard Board. Bert Kelley, 2307 S. Clark Ave., Tampa, Florida 33609.

ST-5A Boards only \$5.25. Parts kit \$54.00 (includes boards) Mod. kit for up-dating ST-5 to an ST-5A, \$9.00. ST-6 boards only \$18.00 (8 original by Irv Hoff W6FFC). Pemco 50A frequency counter semi-kit \$125.00, Pemco SC250 frequency pre-scaler kit, \$30.00. ST-5A, AK-1, ST-6 boards are 12 pin plug-in. All boards etc. shipped postage paid. All boards G-10FR4 glass epoxy and plated, all boards are drilled. Please write for details. Pemco, 422 18th St N.E. Salem, Oregon, 97301.

WANTED: TELETYPE MACHINES also parts and accessories for Models 28, 32, 33 & 35. Call or Write: A.D.M. Communications, 1265 Simpson Way, Escondido, Calif. 92025 (714) 747-0374

MANY RTTY COMPONENTS, parts. SASE for list. Several Kleinschmidt sets, cheap. G. White, Box 2067, Alexandria, Va. 22302.

WANTED - 33ASR, B. A. THUNMAN, W8ISG, 71 McCollum Street, Galesburg, Michigan 49053. Phone 616 665-7071 or 731-5164.

DAYTON HAMVENTION Expands to three days April 26, 27, 28, 1974 at HARA ARENA and Exhibition Center. Brochures mailed March 15th. Write for information if you have not attended the last two years. P. O. Box 44, Dayton, Ohio 45401.

CHICAGO AREA RTTY OPERATORS; Expert repair work performed at reasonable prices. Cleaning and lubrication; printers \$10.00, keyboards \$5.00, reperfs \$7.00. Repair work \$15.00 plus parts, any Teletype apparatus. Rebuilding by estimate. Phone 312-932-2358, ask for Neil.

FAX PAPER: For Desk-Fax, new (not surplus), precut (not rolls). \$15 per thousand sheets, postpaid worldwide. Bill Johnston, 1808 Pomona Drive, Las Cruces, New Mexico 88001.

BAUDOT LOOP TO ASCII CONVERTER connects right into your loop and delivers 8-level or 6-level ASCII for electronic readouts or ASCII-coded c.r.t. display systems. Loop interface features bridge rectifier and opto-isolator; connects anywhere in your loop trouble-free. Internal latch recognizes LTRS and FIGS codes for correct translation of all RTTY symbols; unshift on space available with one jumper wire on p.c. board. Wired and tested, complete except for 5 volt power supply and one potentiometer, on one 4X6 inch circuit board: \$120. Petit Logic Systems, P. O. Box 51, Oak Harbor, Wa. 98277.

TECHNICAL ADVICE OR INFORMATION would be appreciated in putting the Heath HW16 cw transceiver on RTTY, particularly interested in autostart net operation. Please contact Al Whitehead, VE3GNN, 21 John St. Chatham, Ontario, Canada.

FOR SALE; MODEL 15, Excellent condition, can ship, \$75.00. B. A. Thunman, W8ISG, Galesburg, MI. 49053.

TELETYPE EQUIPMENT FOR SALE: Models 14, 15, 19, 28. TD's, Reperfs, KSR's, ASR's. Parts or complete machines. Write needs and send SASE for complete listing and prices. L. Pfleger, 10615 W. Ridge Rd., Apt. 54, Hales Corners, WI 53130.

MODEL 28 LESU's: BELL TYPE, LESU-8. Complete wiring for 28KSR, contains loop supply, casting with 4 "horns", polar relay socket less relay, etc. \$15.00 each plus shipping. L. Pfleger, 10615 W. Ridge Rd., Apt. 54, Hales Corners, WI 53130.

KLEINSCHMIDT TTY EQUIPMENT, Gears and parts available. TH-5 Converters @ 100 Cycle Shift \$49.95, Converted to 170 Cycles Transmit & Receive \$74.95. Model 14 Typing Reperfs, while they last \$29.95. Andy Electronics, 6319 Long Dr., Houston, Texas 77017 (713) 641-0576.

11/16 PERF. TAPE, 3.00 BOX OF 10, 8.00 per case of 40 rolls. New nylon ribbons, black only, 6 for 3.50, 12 for 5.50. Model 14 R.O. typing reperfs 10.00 ea. Model 28 TD, 3 heads, 45.00 ea, Model 28 typing reperf heads 20.00 ea, Hallifracrafters SX-117 receiver \$110.00, Hallifracrafters HT-37 XMTR \$110.00, P. Davis, 1830 Toepfer Rd., Akron, Ohio 44312

ASR-33, MINT CONDITION. All handbooks plus 2 extra new motors in sealed cartons and other spares. Make written offer. HAL ST-6 circuit boards (7). All components mounted but not connected. Instruction book and schematics. \$150. or best offer. WA8VFK, 314 S. Western Ave. Springfield, OH. 45506.

CLASSIFIED ADS-

U.S. GOVERNMENT SURPLUS Typewriters, Jeeps, Walkie Talkies, Rifles, Binoculars, HandGuns, Boats. Official Guide tells you how and where to buy. \$2.00 H. Morgan, 883 Diana, Akron, Ohio 44307.

RTTY VIDEO DISPLAY UNIT; 1000 characters, plugs into loop or logic circuits. ASCII or Baudot available. Works with any TV set. Leland Associates, 18704 Glastonbury Rd. Detroit, MI. 48219

TELETYPE - KLEINSCHMIDT - MITE -; gears, parts, manuals, tape (11/16, 7/8), toroids, SASE for list. Typetronics, PO Box 8873, Ft. Lauderdale, FL. 33310. Wanted; Tubes 122, 2BP1, Kleinschmidt TD, 60 speed gears, also Mite 75, and 74912 - trade 74913. W4NYF.

HAL COMMUNICATIONS CORP. will display THE line of RTTY equipment at Dayton and other major shows. Phone your orders for pickup at the show. HAL Communications Corp., Box 365RJ, Urbana, IL 61801 Phone 217-359-7373.

FOR SALE: MITE EQUIPMENT. TECHNICAL MANUALS. TM-03315-15, \$9.95. Navships 95898, \$13.75, Navships 0967-170-8010, \$12.50. Navships 0967-066-1020, Simplified Preventive Maintenance Procedures for TT-298s and TT-299s, \$4.50. Shipped postpaid, No CODs. Allow 3 to 4 weeks for delivery. Harry F. March, 200 Fox Drive, Winchester, VA. 22601.

M15 & M19 WIRING DETAILS BOOKLET provides maximum flexibility of use. Schematic shows all terminal points; M15 schematic shows all wiring; detailed instructions for wiring M19 tables. \$1.95 per set, postpaid. TECHNICAL MANUAL on M14 Tape Distributor (description, adjustment, parts). New. \$8 postpaid. 11/16" perforator tape, 10 rolls/\$4.40 rolls/\$12.95. Fax paper, RTTY supplies. Send for list. Jim Cooper, W2BVE, POB 73, Paramus, NJ 07052.

UNIVERSAL AFSK, AUDIO, AND VLF SYNTHESIZER delivers phase-continuous output from 1 to 99,999 Hz with accuracy, calibration, and resolution of one Hertz. Use it to operate AFSK between any two frequencies you program, as a precision audio generator, or as a frequency source in an autostart frequency synthesizer. Kit of all parts, \$135. Write for information. Petit Logic Systems, Box 51, Oak Harbor, Wa. 98277.

WANTED: LTPE-1 Perforators; LRB-6 Underdome reperforators - must have 3-speed gear box. Also interested in Models 28, 32, 33, 35 & 37s. Will pay top price. Amber Industrial Corp., Phone 201/824-1244.

R-390, \$400; 32S1/516F2 \$375.00; BW852 Tank \$40.00; BC-221 w/cal charts, book \$30.00; 28KSR floor \$250.00; table \$225.00. Model 28 typing reperf, \$50.00; Model 14 typing reperf, \$30.00; TD, \$15.00; Perforator HMBRW FM model 19 keyboards \$15.00; CE20-A \$40.00; Band hopper VFO \$20.00; OS-8 scope \$30.00; CB w/t 1 wt 3Cnll, \$50.00 pr; PL-172 \$80.00; 4-1000, \$35.00; 4-250A, \$25.00; 4-125A, \$15.00; Eimacvacvar 20-60 pf, \$15.00; Johnson Viking mobile \$30.00; Hmbrew S line supply, \$40.00; NRI color TV course bound in 6 hard back volumes \$40.00; DX-40 \$30.00, SX71, \$30.00, both need work. Add postage G. L. Hale. KOPPIV/4,6334 Edward St. Norfolk, VA 23513. (804) -357-1507.

DETROIT AREA HAMS; The Michigan Amateur Radio Club is planning a project to get more TTY machines on the air. The club meets on fourth Wednesday, 8 PM, at the Madison Heights Library. Come and join us.

FOR SALE; MODEL 32ASR, mint condition, \$400.00. David Balko, W8GUR, 3005 Concord, Trenton, MI. 48183. (313)-676-6856.

WANTED: MODEL 33 & 35 EQUIPMENT. Complete or partial units, any quantity. Will pay shipping. Terminal Systems, Inc., 11300 Hartland St., North Hollywood, CA 91605 (213) 769-6772.

"RTTY SPEED CONVERTER" A drilled, fiberglass 4" x 6 1/2" printed circuit board now available for the WA6JYJ speed converter in the DEC 71 issue of HAM RADIO. \$6.50 postpaid. Complete parts kit including PCB, \$42.00, postpaid. Martex Corp., 519 South Austin, Seattle, WA 98108.

PROGRAMMABLE RTTY DIGITAL STUNT BOX responds with switch closures and a return message when someone calls your station. 64-letter buffer memory (FIFO) plus choice of two types of keyboard input (32 homemade switch closures to ground or 100 w.p.m. loop) lets you type fast and error-free, yielding 60 w.p.m. output. End of line indicator for keyboard input helps prevent overprinting. Larger memory and other options available. Complete kit \$245. Write for information. Petit Logic Systems, Box 51, Oak Harbor, Wa. 98277.

#28 Reperforator-transmitter with 3 speed gear shifts ready to operate \$145. #28 Typing reperforator 60 or 100 WPM \$49. #32KSR - \$250. R-390A \$475.00. Alltronics - Howard Co. Box 19, Boston, Mass. 02101 (617-742-0048).

HAL COMMUNICATIONS CORP. can provide you with the proven video display system, the RVD-1002. When coupled with the RKB-1 keyboard, you will have the ultimate in noiseless, reliable reception and transmission of Baudot coded TTY. The RVD-1002 receives TTY pulses from the HAL ST-6 or any other demodulator, and generates a 1000 character display. Copies at all four standard speeds with selectable unshift on space. The RKB-1 features a high quality commercial keyboard, reliable solid state circuitry, and a rugged, attractive cabinet. Our prices haven't changed for 2 years, so act now. BankAmericard and Mastercharge now accepted. HAL Communications Corp., Box 365RJ, Urbana, IL 61801. Phone 217-359-7373.

OA-5 SOLID-STATE TERMINAL UNIT. See February "RTTY Journal". Drilled and plated boards, \$15.00; parts kit with board, \$100.00; complete unit, ready for air, \$210.00. Ken Simpson, WA8ETX, 3700 Mountview, Alliance, Ohio 44601.

DX-100, \$85.00; ART-13 wps \$55.00; BC221 w b \$50.00; Case for video teleprinter \$45.00; New LBO-301 Leader scope \$300.00; Trade for photographic equipment or 32KSR. M. Jones, Box 191, Fortson, GA. 31808.

WANTED - Back issues of RTTY, also QST before 1934, CQ before 1955, ARRL Handbooks. Jean G. Pelletier VE2AIP, Box 148, Mont St. Gregoire, Que. Canada.

PICTURE PERF TAPES, error-free 11/16" CHAD type. Run time from 3 min. to 6 hours. Art, animals, cartoons, distaff, holiday themes, portraits. Formatting features make it unimportant whether your machine is equipped with auto-downshift-on-space, auto-CR-LF, or has apostrophe over J or S. Send 8 cent stamp for catalog & full info. Joe Dickens, 601 S. Dodson, Urbana, IL 61801

NEED; CONNECTORS FOR CV-89 converter, CV-89 manual, connectors for R-390A, UG-421-U, UG-971-U, UG-572/U, Need a CV-483 converter. R. Baumiller, 1696 4th St. Ext., Monongahela, PA. 15063.

Additional Classified on Page 20