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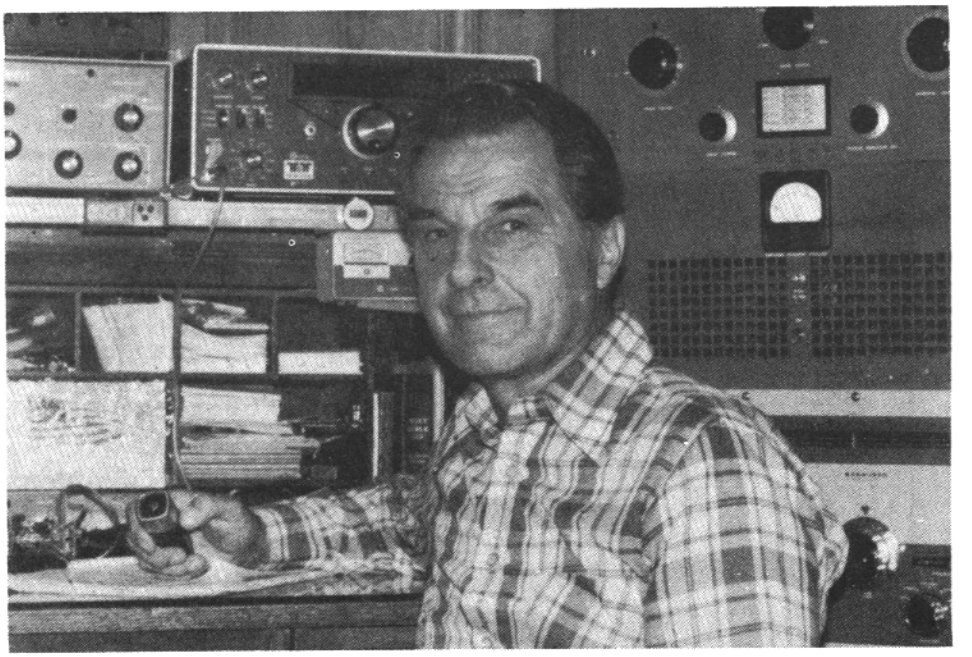

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BACK ISSUES
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RTTY ART CONTEST

The Wireless Institute of Australia is running an International RTTY ART Contest as part of its 75th Anniversary.

There are three catagories (1) best hand originated original, submitted by its author outside of Australia. (2) best hand generated original submitted by its author who is an Australian. (3) Best non-original hand generated or computer generated RTTY picture.

Additional rules are as follows: no more than three overlinings, entires must be submitted with hard copy printout and Baudot tape. Entries close August 31,1985 aand must be sent to the Wireless Institute of Australia, 412 Brunswick Street, Fitzroy 3065, Victoria Australia.

EXTENSION

PRB-1 was files by the ARRL on July 16th, 1984 and requests the Commission to exercise federal preemptive authority over state and local zoning regulations which affect transmitters and antennas used by Amateur Radio Operators. Reply comments have been extended to January 25,1985. Comments must go to:Secretary FCC, 1919 "M" Street N.W., Washington, D.C. 20554.

VIDEO TAPE

Amateur Radio's newest frontier will be available to your local Public Broadcast Station via a satellite feed from KVED in Salt Lake City, Utah. THe videotape will be transmitted at 1530 hours Mountain Standard Time on December 30th over the Pacific Mountain Network (Schedule C) using Westar 4 transponder 10.

Call your local PBS station and let them know of your local interest in it. This is a documentary of Owen Garriott, W5LFL, ST-9 operation. The more calls the more likely they will pick up this feed.

STAMPS

The average Amateur Radio Operator has desk drawers full of stamps from DX QSL's. Elmer Worth, KI3N (ex-K3YNN), 946 Franklin Street, Reading, PA 19602 would like us to donate these stamps for distribution to stamp collecting patients at the Veterans Hospital up in Lebanon, Pennsylvania.

I will close my column this month a little short and a lot late due to the fact that I was injured in an auto accident by an unlicensed (uninsured of course) driver running a red stop light. I now have to wear a back brace and this old body sure aches. The damage to my S-10 Blazer was over $1,000.00.

So long for now, George, WA6CQW.

[ED. note. KA6NYK, John and I drove out to El Cajon on Saturday, December 22nd to pick up this column from George and he sure was hurting. We were persuaded by XYL Jeanne to stay for dinner and since she was making her famous Carne Asada, John and I readily accepted.

George was comfortable most of the time while sitting in his recliner chair, but when walking or standing or when he could just not sit still any longer and had to get up he was almost doubled over.

We wish them both good health in the New Year. And a pox on unlicensed/or drunk drivers.]

WE ARE VERY LATE THIS MONTH

If you read the adjoining column by George, you now know of his trials and tribulations. I came home from his house went to bed and the next day wrote his column and started getting the JOURNAL ready to take to the printer. Had space remaining and so thought I could put some Ham Helps in it the following day and be ready. The following day, Christmas Eve, I was in bed with some kind of bug that wouldn't go away. To make a long tale short, my hiatal hernia flared up, contracted broncitis, became allergic to the medications and missed both Christmas and New Years celebrations. The boys came home for Christmas and had to make their own dinner, with instructions from the bedroom now and then. Today is Wednesday and I hope to get this to the printer early in the morning.

Jim Sladek, WB4UBD submitted the following configuration from his shack: Heath SB-401 with Sigma XR-3000D amplifier for Heath SB-303 & Kenwood R-1000. Heath HW-202 for 2 meter RTTY. TRS-80 I with LNW expansion interface, Teac disk drives and MX-80 printer. RTTY equipment consists of Crown Microcomputers ROM-116 disk based Dynamic Specialties 800-A TU and Heath HO-10 monitor scope. In addition he developed a patch for the cassette based ROM-116 RTTY program interfacing it for data I/O with the Exatron "Stringy Floppy" mass storage unit (patch is only for the TRS-80 I) and anyone interested in its details can contact Jim (SASE). The majority of his equipment has been modified since he is an electronic engineer and 'tinker'. Jims station works for him except for an RFI problem that he can't seem to lick since he is on the second floor.

Anyone having a similar configuration to this and needing some help can contact him and he will try to assist them. SASE please! [His patch sounds like something needed by TRS-80 Model I users.]

We met Emile Alline, NE5S at a convention and he is one of the most helpful Hams I know of. He sent the following for **IBM-PC and JR. users!**

" I have written software for the IBM

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MSO'S

by *Dick Uhrmacher,* K0VKH

Hi Gang! A very HAPPY NEW YEAR to each and all of you, and I hope that 1985 brings you everything you desire! I can't believe that it's time to talk about the 1985 Dayton Hamvention already, but it's sneaking up on us fast. As usual there will be a gathering of RTTY enthusiasts at the Imperial House North in Dayton again this year, and I hope that I'll see YOU there!

A NATIONAL RTTY MSO/TRAFFIC SYSTEM?

Recent developments in utilizing MSO's and CBMS's (Computer Based Mailbox Systems), in handling formal written traffic have prompted this author to issue a "Call to Arms". It would appear to me that these sophisticated RTTY systems are a "natural" for the routine, day-to-day handling of ARRL formal traffic. What could be more convenient, yet reliable and flexible, than a series of strategically placed and utilized MSOs/CBMSs, spread across the United States in a way where propagation and time-of-day would minimally effect the flow of traffic? Well thought out frequency coordination, traffic flow patterns, crystal control of equipment to insure reliable net operation etc., could provide for the expedient, yet reliable flow of traffic, with minimal operator intervention. There are some "pioneers" out there now experimenting in this area, KAØJRQ, KBØMB, K7IFG, to name a few, and it would appear to me that there is an opportunity to devote MSOs and CBMSs' to a worthwhile service in Amateur Radio. Who's ready to throw down the gauntlet and start some testing? If I can be of some service in this area, contact me directly, through my MSO, or via the RTTY JOURNAL!

RTTY DERBY

Well, I knew as soon as I mentioned the Dick Tracy wristwatch radio, that someone would provide a "Can You Top This?" story! And this months gem comes to me via the AJØX MSO. It seems like some time ago Joe, AJØX, described his state-of-the-art RTTY installation in his motorhome. Not to left behind in this world of keeping up with the Jones's, Mike, WA9ESX provides an intimate description of his RTTY endeavors. Mike sez: "I read of your motorhome setup, and wanted you to know that you weren't alone on mobile RTTY. Right now, as I'm typing this, I'm on the North-South Freeway on my Harley "Hog". She is a full dresser, and while some guys might settle for a CB rig or a stereo cassette, I hooked up the RTTY station to the mobile rig, and here I am doing 55 MPH, laying back on the Ol' Hog, RTTYing away! For an antenna I have a circularly polarized Beany antenna, that is in constant rota, also serving as the flywheel for the auxilliary generator.

"It's a pain in the neck though, as in a strong crosswind the propeller on my Beany is spinning at 8500 RPM! Once I flew right off the Ol' Hog, and it rode itself all the way to Hurley, where it finally ran out of gas!! SO Joe, I thought I would like to pass this along to you, to see if any other communications pioneers are around.-73 de Mike, WA9ESX"

AUTOMATIC CQ'S

The rapid decline in prices for personal computers has placed these machines within the reach of most all Hams. And, the proliferation of software for them is certainly keeping pace. Most all of the MSO look-alike programs that I've observed on the bands seem to do a fairly good job. However, there is one area where I personally think that good judgement should hold forth over computer driven flexibility. Just recently I had the occasion to observe a computer based mailbox calling "CQ" on an automatic basis, to call attention to its operation and frequency. This particular machine happened to be parked on a very active MSO frequency and although his participation was more than welcome, the "automatic CQ" raised havoc with established QSO's. MSO operations, etc. It is not the "CQ" application that I really object to, (although I suspect it doesn't take long for the word to get around that you are operating a mailbox on a certain frequency), it's the "automatic" feature that I fear causes an undue amount of QRM and general interference. Calling "CQ" is the time honored way of advertising the fact that you'd like to communicate with another station. But normally the engineer is at the throttle when he's calling "CQ", and to set up a machine capable of automatic calling, where frequency occupancy is not checked FIRST, can only cause LOTS of hard feelings! The very limited frequency allocations available for RTTY operations require that we cooperate to the fullest extent possible in reducing QRM. It's fine to call "CQ", but make SURE the frequency isn't being used first!

1985 DAYTON HAMVENTION

The 1985 Dayton HANVENTION is just around the corner again, and it's time to make your plans now! Jerry, WA1IUF, of the 14097.5 KHz Autostart Group, informs me that they will be hosting the Annual RTTY Dinner again this year, during the Hamvention. The RTTY Dinner will again be held at the Imperial House North (Needmore and I-75,) in Dayton, Ohio, on Saturday night, April 27,1985. Reservations at this dinner are limited to aproximately 50 guests, so it pays to register early. You may register by contacting Jerry directly, or through his mailbox on 14.097.5 KHz, or by

MSO CONTINUED

leaving a note in either the KØVKH or AJQX MSOs on the National Autostart Frequency 14087.75 KHz. If you are going to be in Dayton, come join the crowd, as we always have a super time of it!

MSO OF THE MONTH

Frank Bascomb, K4KOZ, Boca Raton, Florida, is not only one of the 'grandfathers' in the MSO service, but he's also one of the real "Old Timers" in Amateur Radio. It has been my pleasure to associate with Frank on the National Autostart Frequency for almost six years now, and his MSO is a real workhorse! Down through the years Frank has been known as 8AAS, W2EBH, W8JHJ and WUOLT, calls from the Eastern, Midwest and Southern United States. Frank was at one time the Service Director for "Uncle Daves Radio Shack", (a well known eastern Ham Radio outlet), and was associated with Ted McElroy, (the all-time telegraphy speed record holder and electronic equipment manufacturer). Frank also owned and operated several businesses within the electronic industry. He and his wife Erna are now retired in Boca Raton, where he enjoys golfing, fishing and Amateur Radio. Frank's MSO equipment equipment consists of the HAL MSO Disk System, A Kenwood TS-930S, and a KLM beam antenna, with which he puts out a whopping MSO signal. Keep up the good work Frank!

This MSO Column is devoted entirely to providing information relative to most any subject concerning MSOs or CBMSs. Our goal with this column is to provide current information about MSOs, equipment used in MSO service, etc., and as such we need YOUR input of information. If you have anything you'd like to see in the column, don't hesitate to write. If you need information about procedures, equipment, frequencies, etc., drop us a line and we'll be more than happy to assist. Take care Gang, and I'll see you next month!

73 De: Dick, KØVKH

DEFINITIONS CONTINUED

from page 14

RO- receive only. Used to describe printers not equipped with keyboards.

RTTY- civilian acronym for "Radioteletype." Pronounced as RiTTY.

Range finder- parter of printer to adjust for distortion. The range is in percent of a code unit. A range of 10 to 90 is perfect. The low end is spacing bias and the high end is marking bias, The range is graduated in 0-120 points. Term is rather obsolete now.

RYRY- Standard TEST signal consisting of one or more lines of alternating "R" and "Y" characters. Useful for verifying performance of Baudot printers, as "R" is bits 2 and 4 marking, while "Y" is bits 1, 3 and 5 marking. If a Baudot printer succeeds in producing a line of RYRY, it will most likely print everything else correctly. The corresponding test for an ASCII printer consists of a line of alternating "U" and "*" (asterisk) characters.

Selcal- Selective calling. A printer or video terminal so equipped will respond to a specified combination of characters such as "N6ELP". It will then turn itself on and display or print as the case may be the signal coming in and remain in this configuration until turned off by the appropriate "NNNN" signal. Most M28s can be equipped with SEL CAL.

Shift- two meanings. In Baudot means to go into the "FIGS" mode. In ASCII, shift means depress and hold the shift key while selecting certain characters or control functions.

Space- One of two standard tones used in digital communication. A steady space tone allows the printer to run open; that is to cycle repeatedly, but without printing anything. Space tone: 2295Hz (narrow shift) 2975 (wide shift) tone at receiver audio output.

Stunt box- a mechanical device to provide machine functions and decode sequential call up codes. Will control printing, CR, LF, Bell, spacing, non-overline, WRU, and will operate electrical switches. Can provide a memory of command. Is also called "function box." It is located on the M28 and M35 beneath and behind the platen.

TD- "TEE DEE", a mechanical device that reads the various codes punched in a perforated paper tape and then transmits them either over the air or to another appliance in the local loop. "TD" stands for "transmitter-distributer." Since it reads each code in parallel fashion but transmits it serially, one could call it a parallel to serial converter as well.

TTY- Teletype.

TU- Terminal unit. The device that interfaces the TTY machine to the radio equipment.

UOS or USOS- unshift on space. This causes the equipment to revert to the "LTRS" mode upon receipt of a space after having been in the "FIGS" mode. This is often a user option on both TTY machines and the electronic video data terminals.

VDT- Video data terminal. Cathode ray tube display unit similar to a television receiver or computer terminal.

Wide shift- 850HZ shift between the mark and space tone.

WRU- Who are you? Also called answer back. Machines and terminals so equipped will respond with a prerecorded message to verify that they are on-line and copying. The most common WRU call-up code is "ZW." For example: For calling up "N6ELP" you would send "ELPZW" or "N6ELPZW". Some WRU systems require a space befor and after the callup code.;other stations require a CR and LF following the code. Note that leaving a WRU unattended by a licensed Amateur operator is illegal, although subject to debate.

That concludes our listing. MSO definitions were not included as they have been printed in the MSO column not too long ago.

BACK TO THE BEGINNING

With all of the new Christmas 'toys' unwrapped, it seems to us that there will probably be a lot of new RTTYers on the bands, wondering what it is all about. So we pieced this together for you to perhaps send to a Ham with newly acquired RTTY equipment.

W1AW BULLETINS

With the exception of some holidays the following is the scheduling of W1AW RTTY bulletins:
Daily 2300, 0200, 0500 UTC,Weekdays also at 1600 UTC.
For special bulletins during a communications emergency monitor W1AW on RTTY, 15 minutes past the hour.

Directly after the normal RTTY broadcast will be relayed the same information in ASCII and then on switching to AMTOR with the same information.

FREQUENCIES USED ON THE HIGH BANDS

RTTY will be found, by 'gentlemans' agreement on the following frequencies:

80 Meters	3600-3650	KHZ
40 Meters	7075-7100	KHZ
20 Meters	14075-14110	KHZ
15 Meters	21075-21100	KHZ
10 Meters	28075-28100	KHZ

No 'agreement' has been defined for 30 Meters, as yet, so it was suggested that the RTTY JOURNAL do the 'honors'. So with that in mind let's try 10.112 to 10.115 since RTTYers are normally found in the higher ranges of the allowable frequencies.

On the VHF/UHF bands there does not seem to be any coast-to-coast specifics except that 145.70 simplex is the one most often encountered. Local usage and repeater use dictates the frequency used for RTTY on these bands. On 220 the simplex choice has been 223.72. Some repeaters have links from 2 meters to 220 MHZ. Local voice repeaters should be utilized to find RTTYers in your area.

There are currently only three ways of transmitting on RTTY: AMTOR (found in the lower portions of the "RTTY" band), ASCII, and BAUDOT (or MURRAY) codes. The following restrictions concerning data rates for Amateur Radio RTTY apply:

FREQUENCY RANGE	MAXIMUM DATA RATE
3.5 to 28.0 MHZ.	300 Baud
28.0 to 50.0 MHZ	1200 Baud
50.0 MHZ and above	19600 Baud

Now that you know where to find RTTYers, a little about RTTY protocol

1. Please be sure the frequency is not in use. Listen, listen and then inquire if the frequency is in use.

2. In order to be sure that ALL machines can come on line start your transmissions with 10 spaces or 'diddles' followed by a carriage return and a line feed (most computers include a line feed with their carriage return). This allows all machines to come on and start on a new line. A carriage return and line feed should end all transmissions also. For myself I use two CR, LF at the beginning and end of transmissions just to be sure that at least one will be sent.

3. Line length should be 68-72 characters, including spaces. Lines that are too long will pile up at the end of the line and those too short will waste paper.

4. Do not use excessive line feeds for some people have machines monitoring certain frequencies (like the National Autostart frequency of 14.085.625) and may come home to find bushels of paper on the floor due to someone using the 'return code' too often. Don't use the CR to clear your screen while on the air.

5. Allow time between transmissions for 'breakers', ususlly a count of 10 will suffice. Break with your call only. Example: DE N6ELP BK. You could be doubling if you send a long transmission before being acknowledged. And this doubling would result in 'garbage' to receiving stations.

6. When in QSO with more than one other Amateur, turn it over to a specific person so there is no confusion as to who is next.

7. When using mailboxes, always close the system after using it. Four N's "NNNN" will usually do the job. Failure to close the system will cause everything that follows to be recorded. And other mailboxes cannot be accessed until the first one is closed.

8. When calling CQ one line of CQ followed by your call two or three times should suffice. Wait one minute and repeat. More people are turned OFF than are turned ON by excessive sending of CQ or RY lines than anything else. If you have a 'fancy' computer print-out of call, time etc. do not repeat it at the end of each transmission, it is redundant.

9. After terminating a QSO please be sure that your transmitter is not keyed. You must be in control when your station is on the air. Do not leave it unattended while in the transmit mode.

10. This list cannot be conpleted without the most important of the ten

Do unto others as you would have them do unto you. Ladies and Gentlemen are always welcomed- while LIDS are not!

EMERGENCY TRAFFIC HANDLING

Since RTTY is the ideal mode for this kind of operation, we should all be skilled in its operation.

Most health and welfare traffic will be temporarily held until all priority messages have been sent so it is best to have those messages stored on disk or tape, ready to be sent out at full speed when the priority traffic has been completed. One way of becoming adept at handling emergency traffic is to become familiar with traffic handling in traffic nets found in most localaties.

Procedures are very much like those traffic nets on voice, with notable exception being one of verification. On RTTY the confirmation line follows the signature line. Confirmation (CFM) should include: last name, city and phone number.

to page 12 please..

HAVE RTTY—WILL TRAVEL

Yes, now you can take it with you! The new **HAL CWR-6850 Telereader** is the smallest RTTY and CW terminal available, complete with CRT display screen. Stay active with your RTTY and CW friends even while traveling. Some of the outstanding features of the CWR-6850 are:

- **Send and receive ASCII, Baudot, and Morse code**
- **RTTY and Morse demodulators are built-in**
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- **Pretype up to 15 lines of text**
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Write or call for more details. See the CWR-6850 at your favorite HAL dealer.

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DX

JOE WOOD, AJØX

POB 84

LAUREL, MS 39440

HAPPY NEW YEAR! Time to throw the old calendar in the circular file and break out a new one. The Almanac tells me that it is late Fall, but the temperature, as I prepare this, is in the low seventies. Wish the temp would go down just a bit and wipe out some of the local QRN that the warm temperatures bring me. I need all the help that I can get and all that noise doesn't help at all when trying to copy those weak ones. Had a clean shot at the Knights of Malta on seventy-five SSB (dirty words) the other night, and as you read this, I hope that the RTTY operation from that semi-rare location isn't a thing of the past. It was scheduled for the week-end of 15-16 December, and has been anxiously awaited, for most of us, for sometime. What better way is there to end 1984 than with K.O.M. in the log!

FLASH!! How about an exclusive RTTY operation from a rare DX spot? From Jim, WB4UBD, comes word of Cocos Island. Jim writes: "TI2SK and TI2FPE plan to operate from Cocos Island February 11 to 15. They will be using the callsign TI9TTY and be operating exclusively on RTTY with a possibility of AMTOR. QSLs go via: James Sladeck, WB4UBD, 1601 Melrose Parkway Norfolk, VA 23508". What better way to start a new year than to work this group. I need Cocos on RTTY and I'll bet most of you do too. Go get-um tigers!

After a weeks rest from trying to capture the Cocos group, you all will have a chance to pick up some more new ones in the "World Championship Contest" on February 23. I mentioned this in last months column and thought it worth bringing to your attention again. Mark that new calendar now for both of these upcoming nerve twisters.

Our operating habits become a little rusty from time to time and we tend to forget some of the basic rules of RTTY contest and DX operating. Every mass gathering on the bands gives one a chance to renew friendships and the temptation to rag-chew with the participants in overwhelming and very "score degrading". Keep this in mind when you've broken the pile-up and have the DX stations attention. Someone else may be waiting in line for a chance to contact that station and just because he stops to answer your questions and comments is no indication that he is doing it willingly. There are a bunch of DOs and DON'Ts, most of them are common sense rules, but the overwhelming ones are long strings of RYs and call signs. Short calls should be the order of the day (and most other days also). If you are an alert operator the other station should not have to send any RYs at all and vice versa. Elimination of this one thing would go a long way to reduce QRM and increase contacts, multipliers, etc. If all of the equipment manufacturers would build more stability into their equipment then those darned R.I.T. controls could be left off the front panel. To my knowledge, there is no other singular cause for frequency dancing than that one feature. On many occasions I have, as I'm sure you have too, either participated in or watched a QSO move up or down the band. As crowded as our bands are, we do not need that sort of thing. Kenwood and Icom have apparently seen the light, they now offer "high stability reference oscillators" for their TS930 and IC751, respectively. Perhaps, one day, that option will be a standard feature on A L L rigs. It won't be too soon for me!

I just received a sample copy of a new periodical that is published in Canada and is directed toward contesting. A worthy effort but one thing puzzles me. One of the aims of the group is to establish an automatic computer based station on, of all frequencies, 14.099! The purpose of this station is to provide updated, current contest and DX information. It seems to me that the Northern California DX Foundation sponsored beacon stations, our propagation indicators, are going to suffer with such an operation in close proximity. Their intent is a good one. To move this type of operation to the high end of the RTTY active segment is even better but to put it right next to the beacon frequency is a bit inconceivable. My personal preference would be to see all semi or full automatic operations of this sort above 14.100 at say 14.105 to 14.120. And yes, this includes my own mailbox operation! Do any of you have suggestions for a self imposed band plan? I have had some thoughts for twenty meters. Reduce the "extra" CW segment to 10 KHz. Then, the extras would have 14.000 to 14.010, all other classes (excluding Novice) from 14.010 to 14.070 CW only, 14.070 to 14.100 RTTY and 14.100 to 14.120 for semi or automatic computer based mailbox or bulletin board operations. It sure would go a long way toward reducing a lot of the frustration that abounds on the low end of twenty meters. Room has to made for the booming RTTY mode that technological advance has created and now is the time for action. Hope to hear the pros and cons on this from each of you. A postcard with your comments, suggestions, etc. will indicate your concern and if enough response is generated, the tabulated results will appear here! Join in and help carry the ball.

CONGRATULATIONS

To those of you that have recently been admitted to the ARRL Century Club, are going to be delayed. It seems that an overwhelming number of applications, updates and whatever has thrown the reporting of these achievements off by at least a month. Could they be trying to tell us that they are overworked or simply busy

ENGINEERING MAKES THE DIFFERENCE

Production Expertise And Service Integrity Form The Foundation For Your Long-Term Satisfaction

The fact that the Computer Patch Interface unit by Advanced Electronic Applications, Inc. is known as the best value on the market is no accident. The CP-1 was designed by Al Chandler, K6RFK (PHD-E.E.), an active RTTY user since 1963.

Given a cost per unit budget for the CP-1, Al designed as much performance as possible into the Computer Patch, including a unique new tuning indicator, referred to by one of our customers as the "Dead Eye Dick" tuning indicator. This indicator is ideal for RTTY and CW, in that it is both fast to tune and (within 10 Hz) as accurate as scope tuning. It also performs under poor signal to noise conditions in which other indicators provide no useful data.

Al's variable shift tuning was designed to move the space filter center frequency from 2225 Hz to 3125 Hz without changing the bandwidth (by varying the Q of the filter). All this is accomplished using a precision ganged potentiometer to assure proper tracking of the multiple filter stages. We could have used a pot costing a tenth as much by simply using a two-pole filter design, but we feel the advantage of a sharper filter reduces the noise bandwidth significantly and allows the variable shift control to be used like passband tuning for extra elimination of adjacent channel interference.

Some manufacturers are concerned that amateurs might try calibrating their own equipment and, therefore, have used non-adjustable components, which results in sub-optimal performance. Although more costly, trimpots used in AEA equipment allow factory adjustment for performance to design specifications. Competently designed active filter circuits need not be adjusted after leaving the factory; however, for specialized use the owner can easily change filter parameters.

Mindful of the fact that many of our customers are new to RTTY, Al made the CP-1 tuning as forgiving as possible, while providing the most critical operator a piece of equipment in which he could be proud. Even old "pro's" are surprised at the poor signal conditions under which the CP-1 will still provide good copy.

You can now experience the BEST RTTY, CW, and AMTOR offered. Couple the CP-1 with our new AEASOFT™ software packages designed for the MARS, SWL, or amateur radio operator, and you will feel a pride reminiscent of what "made in U.S.A." brought in years gone by. Please do not hold the low price of the CP-1 against us. This is one case where you get much more than you pay for relative to any of the competitive units. For more information send for our FREE cataiog. Better yet, see your favorite dealer.

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DX COLUMN CONTINUED
from page 8

they are overworked or simply busy researching another DX? article that echoes "a visit with "National Geographic" or preparing another book review?

In addition to the, hopefully now past, K.O.M. and the upcoming Cocos Island operations, there have been few DX reports for this reporter to pass on to you. My activity level as well as that of faithful few has been down this past period, lots of other things going on that seem to take their share of time. The bands have been closing very early and by the time most of us get home there is nothing but the 40 and local 75 meter nets going. Not much chance for DXing when that occurs although there is a wealth of DX to be worked on those bands, however not with my favorite mode. On to.....

Carl, K6WZ, writes that A35RS on Tonga, for one week was a Radio Club DXpedition. This information was carried in my mailbox, and I hope you all were alerted and had an opportunity to work Bob. Additionally, Carl said that he had just received a QSL from ZK2RS which brings him to 137/155. He also made mention of Gin, JA1ACB, as having furnished equipment to VP2VAT.

I have received several requests for QSL information and will be happy to provide that if the request is accompanied by a S.A.S.E. or S.A.E. with IRCs. I have also been asked; when are you going to publish a complete list of DXCC RTTY AWARDS from Number 1 to date? [ED note: very soon].

This writer looks forward to input from those of you that are interested in this mode and assumes that you are interested in it or you would not be reading this column. Let me hear your thoughts and suggestions. Be assured, they will not be judged but passed on for all to see and reflect upon... and then the judgement! Thanks go out to W5DOZ, W9CD, N1API, W2JGR, W1DA, K6WZ, JA1DSI, VK2BQS, WB4UBD, KT1N, WB1AQA, and VE3FJB for their unselfish effort in keeping the DX word spread.

I wish you a great New Year. May you fill those blank spaces in your log with the choicest of DX, whether it be countries, states, or counties, and may you do so without the benefit of R.I.T.

Until next month, the best to each of you.

73, Joe, AJØX....SK

DX - Heard, Worked and, where available, QSL routes

A35RS	14.095	0352Z	QSL:ZL1ANJ or JA1KDD
	21.090	2230Z	" " "
ZS3TL	21.090	1600Z	QSL:POB 2282, Windhoek, Nambia also try W7PHO.
7P8CL	21.094	1654Z	QSL:SM5KDM.
ZS5QQ	7.084	0322Z	QSL: Callbook
D44BC	21.084	1447Z	QSL: POB 36 Mindelo, Cape
	14.087	1505Z	Verde Isles.
ISØDYX	21.090		QSL: POB 25 Cagliari, Sardinia Isle
FM7BH	14.095	2103Z	QSL: F2BS
UB3GCP	14.095	1824Z	QSL: Box 88, Moscow, USSR
C53CL	14.099	1109Z	QSL: EA8ZZ
VP9BY	14.090	1830Z	QSL: TUUV POB 73, Devonshire, Bermuda

HAM HELPS

Since so many of you have subscriptions that run out around the end of the year, I thought that you would all use that opportunity to do, as I asked, namely send a description of your efforts to get your RTTY station configured and on the air. I know that you ALL did not just plug in a computer, etc., and go on your merry way. For the terms RTTY and computer interface seem to be mutually exclusive. Out of all the mail we received here only three were as requested.

Jules Freundlich, W2JGR, 17 Nassau Blvd., Malverne, NY 11565 writes that he needs to know how to disable automatic printer shutdown, when his Gorilla (GX-100) printer receives a bell signal. His printer receives its input from Kantronics Hamsoft module on TI-99/4A. With this software his bell signal is a control G. The printer interprets bell signal as an error. The power switch must **be** cycled off and back on to restore normal printer operation. Jules goes on to say that he has no technical data on the printer other than cable pinouts. If anyone can help let Jules and us know so we can possible help others with the info.

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Code: Morse (CW includes Kana), Baudot (RTTY), ASCII (RTTY), JIS (RTTY), ARQ/FEC (AMTOR).
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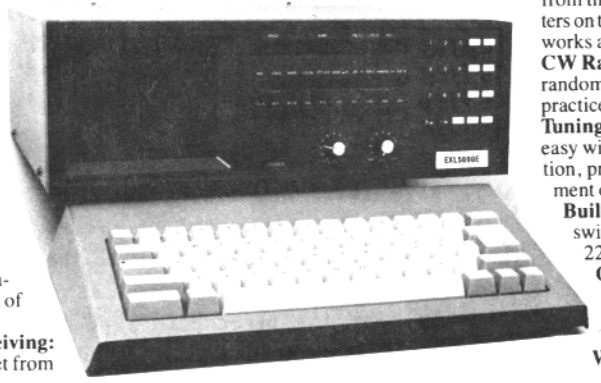
Crystal Controlled AFSK Modulator: A transceiver without FSK function can transmit in RTTY mode by utilizing the high stability crystal-controlled modulator controlled by the computer.
Photocoupler CW, FSK Keyer built-in: Very high voltage, high current photocoupler keyer is provided for CW, FSK keying.
Convenient ASCII Key Arrangement: The keyboard layout is ASCII arrangement with function keys. Automatic insertion of LTR/FIG code makes operation a breeze.
Battery Back-up Memory: Data in the battery back-up memory, covering 72 characters x 7 channels and 24 characters x 8 channels, is retained even when the external power source is removed. Messages can be recalled from a keyboard instruction and some particular channels can be read out continuously. You can write messages into any channel while receiving.
Large Capacity Display Memory: Covers up to 1,280 characters. Screen Format contains 40 characters x 16 lines x 2 pages.
Screen Display Type-Ahead Buffer Memory: A 160-character buffer memory is displayed on the lower part of the screen. The characters move to the left erasing one by one as soon as they are transmitted. Messages can be written during the receiving state for transmission with battery back-up memory or SEND function.
Function Display System: Each function (mode, channel number, speed, etc.) is displayed on the screen.
Printer Interface: Centronics Para Compatible interface enables easy connection of a low-cost dot printer for hard copy.
Wide Range of Transmitting and Receiving: Morse Code transmitting speed can be set from the keyboard at any rate between 5-100 WPM (every word per minute). AUTOTRACK on receive. For communication in Baudot and ASCII Codes, rate is variable by a keyboard instruction between 12-300 Baud when using RTTY Modem and between 12-600 Baud when using TTL level. The variable speed feature makes the unit ideal for amateur, business and commercial use.
Pre-load Function: The buffer memory can store the messages written from the keyboard instead of sending them immediately. The stored messages can be sent with a keyboard command.
"RUB-OUT" Function: You can correct mistakes while writing messages in the buffer memory. Misspellings can also be erased while the information is still in the buffer memory.
Automatic CR/LF: While transmitting. CR/LF automatically sent every 64, 72 or 80 characters.
WORD MODE operation: Characters can be transmitted by word groupings, not every character, from the buffer memory with keyboard instruction.
LINE MODE operation: Characters can be transmitted by line groupings from the buffer memory.
WORD-WRAP-AROUND operation: In receive mode, WORD-WRAP-AROUND prevents the last word of the line from splitting in two and makes the screen easily read.
"ECHO" Function: With a keyboard instruction, received data can be read and sent out at the same time. This function enables a cassette tape recorder to be used as a back-up memory, and a system can be created just like telex which uses paper tape.
Cursor Control Function: Full cursor control (up/down, left/right) is available from the keyboard. Test Message Function: "RY" and "QBF" test messages can be repeated with this function.
MARK-AND-BREAK (SPACE-AND-BREAK) System: Either mark or space tone can be used to copy RTTY.
Variable CW weights: For CW transmission, weights (ratio of dot to dash) can be changed within the limits of 1:3-1:7.
Audio Monitor Circuit: A built-in audio monitor circuit with an automatic transmit/receive switch enables checking of the transmitting and receiving state. In receive mode, it is possible to check the output of the mark filter, the space filter and AGC amplifier prior to the filters.



CW Practice Function: The unit reads data from the hand key and displays the characters on the screen. CW keying output circuit works according to the key operation.
CW Random Generator: Output of CW random signal can be used as CW reading practice. **Bargraph LED Meter for Tuning:** Tuning of CW and RTTY is very easy with the bargraph LED meter. In addition, provision has been made for attachment of an oscilloscope to aid tuning.
Built-in AC/DC: Power supply is switchable as required; 100-120 VAC; 220-240 VAC/ 50/60Hz + 13:8VDC.
Color: Light grey with dark grey trim — matches most current transceivers. **Dimensions:** 363(W) x 121(H) x 351(D) mm: Terminal Unit.
Warranty: One Year Limited

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**Dual Amtor: Commercial quality,* the EXL-5000E incorporates *two completely separate modems* to fully support the amateur Amtor codes and *all* of the CCIR recommendations 476-2 for commercial requirements.

"BEGINNING" CONTINUED

from page 6

ARRL numbered Radiograms can and should be used where possible. For a copy of the ARRL numbered radiograms, send a SASE to ARRL. Better yet, send $ 0.50 and request additionally the Leagues booklets, "PUBLIC SERVICE COMMUNICATIONS MANUAL", and "OPERATING AN AMATEUR RADIO STATION". These two booklets should be on the library shelf of all Hams.

In addition to the "Q" codes, the following "H" codes are used on RTTY traffic nets:

HXA-(followed by number). Collect landline delivery authorized by adressee within ____ miles. If no number, authorization is unlimited) Be careful with this one.

HXB-(followed by number) Cancel message if not delivered within hours of filing time: service originating station.

HXC- report time and date of delivery (TOD) to originating station.

HXD- Report to originating station the identity of station from which received, plus time and date of delivery. Report identity of station to which relayed, plus time and date, or if delivered report time, date and method of delivery.

HXE- Delivering station gets reply from addressee, originate message back.

HXF- (followed by number) Hold delivery until ____(date).

HXG- Delivery by landline toll not required. If toll or other expense involved, cancel message and service originating station.

TERMS USED ON RTTY

AFSK- Audio frequency shift keying. These are the tones used to produce the "Mark" and "Space" signals. A2 transmission.

Answer-back-Automatic call-up and answer back.

ASCII- American Standard Coding (for) Information Interchange. A code system using eight bits, seven data bits plus one parity bit. Used by Models 33 and higher Teleprinters and most computer video terminals.

ASR- Automatic send/receive (usually with reperforator and TD). Used as additional identifcation on Teletype Corporation machines as: 33ASR.

Autostart-circuit or device that activates a printer or printer's motor upon receipt of an RTTY signal. Also deactivates the printer's motor after the signal is no longer being received.

Baud-the rate of information bits transmitted per second. 45.45 is the most frequently used baud rate, followed by 50, 57, 75, 110, and 300 baud. 45.45 is 60 words per minute and 74.20 is 100 WPM. 110 is 110 ASCII.

Baudot- A five level code used by early Teleprinter machines (numbers 12 through 28) and many video terminals. Named after Emile Baudot, it is often called the Murray code in Europe especially. There are 32 possible combinations of the five bits.

Bell- Some Teleprinters and terminals are equipped with a signal bell that responds to "FIGS S" or "FIGS J" in Baudot, or "CTRL G" in ASCII. It is generally used to alert a station on autostart that a signal is coming in.

Blank- Teleprinter machines sometimes will have this "key that prints nothing". It is an unmarked key found at the lower right hand corner of the machine. It is sometimes used as a stop to stop the perforated tape at a designated point (termed a double blank). Some older models revert to the receive mode and/or lock their keyboard when a double blank is transmitted. On ASCII machines a blank occurs by typing a "P" with the control (CTRL) and shift keys depressed. The blank is also called a "null".

CHAD-A chad is the hole punched out of a perforated tape. A Chad type perforator punches the hole out completely, while the Chad-less perforator leaves the Chad attached but hinged along its' leading edge.

CR- Carriage return, returns to a new line.

CTRL- Control. Allows selection of certain control functions on ASCII printers and terminals. Typically there are 32 control functions that are available.

CWID- Morse code identification of a station. The FCC has made this requirement obsolete, but some stations will still use it.

Eight level machine- Another term for ASCII.

ES GRP- abbreviation for "and the group", used in roundtable discussions.

ET AL- "and others" used in roundtable discussions when sending your station identification.

FIGS- Figures. Machine or terminal displays figures and punctuation, as opposed to "letters" which is an upper case function.

Five level- Another term for Baudot (pronounced Baw dough).

FSK- Frequency shift keying. Shifting the RF carrier frequency for desired shift. F1 transmission.

Glass teleprinter- A "VDT" or any cathode ray tube device used to display data, rather than have it printed only on paper.

Bias distortion- Mark signals not of equal time duration. Longer, is a marking bias. Shorter is a spacing bias.

Black Jack- Old slang term for keyboard.

KSR- Keyboard send/receive. As in 33KSR machine.

LF- Line feed. Indexes up a new line of paper on Teleprinter machines; in most cases does not affect a video terminal.

to page 14 please..

CLASSIFIED ADS

30 words $3.00, additional words 5 cents each - Cash with copy. Deadline 1st of month for following month.

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WANTED: 28 RO. New or like new condx. Sell like new Model 32. George Churpek, N6FL, 839 Cambon Circle, Ojai, CA 93023. Tel: 805-646-5296.

HAL COMMUNICATIONS STRIKES AGAIN! If you have an IBM-PC Personal Computer, then you want to utilize the new HAL PCI-2000 interface and software to turn it into the ultimate in a computer based RTTY system! Morse, Baudot and ASCII, 103/202 modems, all speeds/shifts, split screen, and a host of other features. Write or call Dick, KØVKH, DIALTA Amateur Radio Supply, 212-48th St., Rapid City, SD 57702. 605-343-6127. Our prices can't be beat!

TELETYPE 33KRS's friction feed, automatic carriage return & line feed, purchased new 1981, used 13 months, some of the last made by TTY Corp. RS232 interface & pedestal included only $75 each or trade? Only a few left. IRL 1000 with AFSK keyer $325. N4BRX, 413 Seneca Ave., 40209. 502-368-7845.

PC BOARDS*VERSATILE CKTS. RTTY and SSTV. Highest quality double sided plated through hole PC boards with silk screened legend. GUARANTEED.Complete instructions and parts ordering information available. Send SASE for information to: DYNAMIC SPECIALTIES, POB 20903, San Jose, CA 95160.

FDM RTTY DEMODULATORS. Frederick 1202R series. Useful for AP/UPI news on HF radio. Commodities News Service on FM SCA broadcasts and UPI "one state per channel" satellite FM/SCPC transmissions. Four models available in various conditions, $35 to $350. Call/write for full brochure. Electrovalue Industrial, Inc., POB 376-RJ, Morris Plains, NJ 07950. 201-267-1117.

FOR SALE-We are overstocked due to many large volume buys and are passing the good buys on.5 level machines Model 32RO (standard UCC5) $80. Model 32KSR $90. Model 32ASR $125. Model 32ASR (w/UCC9 Telex config) $175. 8 level machines Model 33RO (standard UCC6) $69, Model 33KSR $75. Model 33 ASR $150. All above units are strapable for 20 or 60MA. All are complete (less stands). Sold as is, but are throughly checked line & local prior to shipping. Stands for Model 32 or 33's $13.00 ea. Parts available for 32's and 33's-please cite part number and name. Paper tape 5 or 8 level $1.25 roll. Roll paper ground wood grade $2 roll. Bond $2.50 roll. Bond form paper 9½ x 11 with tear away perfs. Large box 3400 forms $38. RS-232 interface for M-33 $75 ea. New 0-300 Baud direct connect modems (RS-232) $75 ea. AB RS232 switch box's $107 ea. Please send check for amount of item (NY residents add applicable tax.) Shipping will be COD best way or your choice carrier. (Most can go UPS with new 70lb limits). Any questions please call 516-242-5011. Tram Teletypewriter Service. 50-0 Corbin Ave., Bayshore, NY 11706.

RTTY DEVICES-Model 28 keyboard typing reperfs, TD's, Model 33RO, KSR's, ASR 's, modems, model 28KSR's gears and gearshifts, paperwinders, papeer, ST-5 demodulators, video display units, Burroughs mainframe computer, line printer and control console.model 43 KSR, several Motorola 2-meter FM radios, Mocom 70, Motrac, Motran w/ synthesizers, compa-station. Send SASE for 6-page list and prices. Lawrence R. Pleger,K9WJB, 2600 S. 14th St., St. Cloud, MN 56301. PH 612-255-9794.

RTY DEVICES-Model 28 keyboard typing reperfs, TD's, Model 33RO, KSRs, ASRs modems, Model 28KSRs, gears and gearshifts, paper winders, paper, ST-5 demodulators, video display units, Burroughs mainframe computer, line printer and control console, Model 43KSR, several Motorola 2-meter FM radios, Mocom 70, Motrac, Motran w/ synthesizers, compa-station. Send SASE for 6-page list and prices. Lawrence R. Pfleger, K9WJB, 2600 S.14th St., St.Cloud, MN 56301. PH 612-255-9794.

PC, XT and JR computers that might suit your needs. I sell it direct or through "Advanced Electronic Applications" for $50. However, I will offer it to any bona fide deaf person for $10 (to cover disk and mailing). If the program requires modification to better suit your needs, I can do so." Emile has the AEA CP-1 and '82 ARRL handbook TU's Yaesu FT-980 rig with the homebrewed Hamcom software for his IBM-PC. He may add AMTOR but is not sure as it is unsatisfactory for 'reading the mail.' Emile says anyone needing help.."send 'em over."

Walter, KB6BT thinks that you all may be interested in the SWISS ARTG 2 meter Mailbox, located on Titlis mountain at 3020 meters (that's 10,066 feet!) The station (HB9AK) IDs every 15 minutes and can be accessed in the following fashion:

Mode; 45.45 Baud- Baudot.

Frequency: 144.620 MHz, LSB, Hi tones

Info: HB9AK DE YOUR CALL OUTPUT FOR INFO CR/LF.

All traffic on 2 meters in Switzerland is strictly SSB (F1) so you can use an American modem with the hi tones. Walter says he operated with a Yaesu FT 290 portable rig, an AMT-2 modem an a TRS-80/100 computer. And says Walter it sure is a practical way to keep track of your friends if you have a reciprocal license! The mailbox is oerated by an Apple computer sitting in the basement of HB9-AIR and the traffic is sent via 70 cm to the Titlis. Thanks for sharing this with us Walter.

DEFINITIONS CONTINUED

Loop- Electrical circuit from the TU power supply through the machine, a closed loop is a mark while an open loop is a space.

Local Loop- The DC series loop containing the various appliances in the shack, which would include a printer, a reperferator and a TD. Keying any one of the three causes all to respond in unison.

LTRS- Letters. Machine or terminal displays letter characters as opposed to figures and punctuation. Lower case function.

Mark- one of two standard tones used in transmitting and receiving digital communication. On VHF and above, the mark tone is traditionally the lower of the two, while on HF, the opposite is true. In both cases the mark tone holds the printer at rest when transmitting steadily. See also "space". Mark tone=2125 Hz at receiver audio output.

Model 12- 1920 era. Obsolete but still usable.

Model 14- Usually consists of a TD and a reperforator. It has a tape punch.

Model 15-good rugged page printer capable of up to 75 WPM speed-has limited functions and no stunt box and slow CR. Some still used.

Model 19- M15 page printer with perforator and M14 TD mounted on a table with wiring enclosed. Has own power supply. Termed the "workhorse".

Model 24 and 26 rarely used for RTTY.

Model 28- Many versions of this rugged dependable machines are in use on RTTY. With and without tape handling capabilities. The best Baudot Teleprinter made. It had interchangeable gears for 60 and 75 and 100 WPM. Uses type box with changeable type pallets, CR with one key, stunt box for coding functions and can respond to sequence of characters for station call-up (SELCAL). Three types are available: RO, KSR and ASR. If a mechanical machine is being used it is likely to be a M28 as they are almost indestructable and manuals are still to be found for them.

Model 32-Fancy plastic version of the M28. Good for light non-continuous usage. Uses Baudot code.

Model 33, 35 and 43- All are ASCII versions of the 32. They are used on RTTY but like the 32 are for light non-continuous use. They are not "workhorses". All are available in RO, ASR and KSR versions. Cannot punch tape while receiving.

Modem- Modulator/demodulator. A device used to connect a computer (or similar equipment) to a telephone line and using audio tones to generate data.

NNNN- Standard ending for closure of mailboxes (electronic) or terminating a SELCAL communique. It is used to suppress printing.

Narrow shift- 170 Hz shift between the mark and space tone.

Non-overline- A Teleprinter equipped with non-overline will ignore CR codes, but will respond with a simultaneous CR and LF upon receipt of a LF code. This prevents the printer from overprinting a previously typed line, but at the same time prevents the printer from copying pictures that use overprinting for shading effects. Generally, if one wants clean text copy, non-overline is helpful. Conversely, for all types of pictures to be printed properly, non-overline is a hinderance. Most M28s can be equipped for non-overline by exchanging two function bars in the stunt box.

Null- Same as blank.

QBF-abbreviation for test line "quick brown fox."

RATT- Military acronym for "radioteletypewriter."

Re-inker- Mechanical accesory around which a printer's ribbon can be threaded and then re-inked to prolong ribbon life.

Reperf-When used as a noun, it means "reperforator", a device that automatically punches a paper tape corresponding to an incoming signal. "Typing reperfs" punch tape and type on the tape as well.

Red jack- old term for printer.

Return- Simultaneous CR and LF sent by a video terminal. To page 5 please..

THE TELETYPE MODEL 32ASR
by Dee, N6ELP

Since so many of you have written to us concerning the use of Model 32 and 33s, we thought we would go back and take a look at these 'beasties'.

The dimensions and weight are as follows: width 22 inches, depth 18½ inches, height 8½ inches and weight 44 pounds. The stand adds an additional 24½ inches in height and 12 pounds.

We are writing about the 32ASR (Automatic Send-Receive) but most of the statements made may also be applied to the model 33, which is a model 32 with the modification of ASCII capabilities. Both may be used as low cost printers connected to your computer but do need to have a converter to make them work in that capacity.

We will assume here that you will be using the 32ASR for Radioteletype work and, space permitting, conclude with using the 32ASR as a printer only.

The 32ASR provides facilities for transmission, or for the reading of perforated tape (used in RTTY picture storage). It also provides facilities for page copy, either from the local loop or from your terminal unit. To state it another way, the 32ASR may be used in the following manner:

1. Transmit from the keyboard while making printed page copy and either perforating tape or not perforating tape.
2. Receive page copy, and also, either perforating tape or not perforating tape.
3. Perforating tape from the keyboard while making page copy.
4. Transmit from tape reader while obtaining page copy. For automatic RTTY identification use the 'here is' key. 22 characters are available for coding, by breaking off the plastic tines on the code drum.

The 32 printer is quite different from the models 12, 15, 19, 26 and 28 teleprinters. The basic printer consists of the following major components: (A) keyboard, (B) printer asssembly, (C) motor, (D) sub-base, (E) cover. If by chance the machine has a 'call control assembly', used for TWX and other commercial services, it may be removed, as it is not needed for Amateur Radioteletype useage. The keyboard and printer assesmbly are mounted on the sub-base. The motor is a two pole single phase sync motor operating at 3600 RPM. It has two internal fans and one external fan, to provide cooling. Nylon gears and a flexible belt provide very quiet operations (unlike its predecessors).

The keyboard layout is similar to the early models, but no blank key is provided. The keyboard code bars operate a set of wire contacts which are connected to a printed circuit distributor, which is mounted on the printer assembly. The same PC distributor also generates the start stop code from from the code reader and the 'here is' key. Low values of distortion may be observed when tested with a DTX "test set." Two additional keys, one a break key which opens the keyboard circuit, and the other is a repeat key, which will allow any normal key to be repeated when it is operated prior to the normal key.

The type-wheel is rotationally and vertically positioned to select the proper character, and a small hammer drives the type-wheel and the ribbon against the paper to effect printing. Automatic carriage return and line feed occur after the 72nd character. Unshift on space is also built in. The selector magnet takes 500 mills at 20 volts, which is provided by a printed circuit card called a selector magnet driver. Its input can be wired for either 20 or 60 mils (normal TU outputs) by changing a strap on the rear terminal strip. A power supply for the PC card is mounted to the right side of the printer assembly, under the cover. Another DC power supply is provided which mounts under the printer inside of the base stand.

The type reader (TD) is operated electrically, rather than mechanically. It utilizes the PC distributor (which is also used for the keyboard) to generate the five unit start stop code from the perforations in the tape. A tight tape and tape out switch are included in its design. The switch to start the reader has a "stop-free" position, and a center position which holds the tape fixed without advancing it.

The tape punch (reperforator) is mounted to the left of the printer assembly on the sub-base. The printer selector and code bars also operate the perf/punch unit. A chad box is slid under the left hand side of the printer next to the mounting stand. The tape perforation is chad (a completely perforated hole for a mark impulse.

Access to the 'here is' code drum is from the rear next to the power unit. Coding is done by breaking small plastic ridges off for each marking code. Small wire contact springs are used to read the marking or spacing code on this drum.

The paper holding feature is simple and very effective and the tape for the perforator is also simple and easy to use. There are four keys on the punch unit, on and off, a back space to permit corrections to tape as you punch it, and a tape tension release when starting new tape in the punch. Loading paper is easy, just drop the small center plastic rod through the center and bring the paper up from under the roll, over the spring loaded paper straigntener, under the paper guide and your 32ASR is ready to print.

These machines were designed for light duty service, so keep that in mind if you are planning to purchase one. However, for a VERY low price these machines can be used as entry level RTTY or, again, VERY low cost printer.

Any one needing a manual for the 32 or 33 can write to:Teletype Corp., 5555 Toughy Avenue, Skokie, IL 60077. They still have manuals for the 28 series and up.

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