acc notes

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Version 4 For The '85 and '96

New software is available for ACC's RC-85 and RC-96 Repeater Controllers.

Features common to both upgrades include:

- Support of the Icom IC-900 band units through ACC's FC-900 Interface (now available)
- Programmable Touch-Tone Pad Test prefix
- A fifth macro set
- Programmable alarm and paging talk-out timers
- A reverse patch answer acknowledgement
- Empty command prefixes are ignored to reduce the possibility of code conflicts

New to the '85 are:

- Control op selectable disable autopatch phone number and autodial location readback
- Programmable ID timer
- Reverse patch Mode 3 for talkback paging
- Touch-Tone Access up message

New to the '96 are:

- Support for the Tone Panel option, providing remotely programmable multiple CTCSS decode and encode
- A new DTMF paging format for the memory based paging

The '96 upgrade is free to all '96 owners and will go out automatically in early May. The '85 upgrade is available for $125, or $100 if purchased with the FC-900 Interface. Please order using the enclosed order form. See the last two issues of *ACC Notes* for descriptions of the FC-900 Interface.

ACC Visits Southern California

On March 18th, ACC set up a "one company hamfest" at the Le Meridien Hotel in Newport Beach, California. We invited, by post card, everyone in the area that was on our mailing list to come see our latest equipment, ask questions, and join in refreshments. John and Ed would like to thank everyone who came by - we enjoyed the chance to meet you one-on-one. We hope we'll have the chance to visit *your* area!

"Winter Storm Warning, Carry Chains..."

Ken Stuber, N4KS tells us how the Placer County (CA) Sheriff's Communications Reserve Group uses its ACC Digital Voice Recorder to assist traveling hams. Located in the Sierra foothills, N4KS Repeater (146.04/64) guides its users to reports on road conditions in the winter and fire danger in the summer.

Pressing a simple code calls up the reports, which Ken's group keeps updated, hourly when necessary, to keep the information current.

The DVR supports remotely recorded messages used as IDs, tail messages, bulletin board notices ... any of the remotely programmable messages may be DVR tracks. The recordings can even instruct users through a menu to information of interest - all through Touch-Tone commands, as Ken has shown.

In addition, the DVR provides a voice mailbox, bringing "big-system" voice mail capability to your repeater.

Our Favorite Comm Program

The '850 Computer Interface works with any terminal or computer running a terminal emulator or communications program. Now you can control and download information from you voice repeater from your home computer, or you can program your computer to interact with your repeater automatically.

Our favorite comm program for PCs and compatibles is Procomm Plus. It's a full featured, low priced program that offers just about everything you could want in a comm program. And it's easy to use. Procomm Plus is available for $89 plus $3 shipping from Datastorm Technologies, Inc., P.O. Box 1471, Columbia, MO 65205.

Hint: We've had reports from some CI users that when entering commands, the text response from the controller overwrites the command line. This is because the CI operates half-duplex, and when pressing "ENTER", the terminal needs to move the cursor to the next line. Most comm programs we've seen do this automatically, but not Procomm Plus. If you're using Procomm Plus but don't own the manual, you may not be aware of the key mapping facility, which lets you map (for example) "ENTER" from CR (default) to CR+LF. Select the keyboard mapping screen (ALT-F8); press the key to change (ENTER); enter the new value (^M^J, which represents control-M and control-J or CR and LF); hit ENTER; hit ESCAPE; respond to "Save Changes?" with Y. Now you'll be able to see the CI commands you enter as well as the controller's response.

Computer Interface on Packet

If you want to use your '850 CI on packet instead of, or in addition to, a telephone modem, Michael Chisholm, KA6DAC sends us a detailed list of packet TNC parameters. Request Michael's list of TNC paramaeters with interface instructions to AEA's PK-88 TNC.

How To Fund Your Repeater System

Pat Eckenrode, KJ4WN sends us this report on how his group funded his repeater upgrade.

"Here is the way the Daytona Beach ARA raised funds to support our RC-850 Repeater System.

We first compiled a roster of active and non-active club members and also those names of persons who belonged to the club at one time.

We then enclosed a letter of our intention to add all of the features the new controller would provide, in our monthly publication.

Then we started two different portions of our club:

1. A Club Supporter, $10 per year, with voting rights.

2. A Repeater Supporter, $20 per year, with voting rights, autopatch privileges, a repeater user-guide, tape and information, autodial numbers, paging prefixes, mailbox messages, and a detailed mailbox user list specifying whether or not the user had a pager.

Another interesting "money maker" was to have a repeater donation plate at every club function such as club meetings, hamfests, club auctions, Field Day, and our club banquet.

These ideas helped us to obtain money for a weather receiver for up-to-the-second weather warnings, a 220 MHz space shuttle audio link, and helped us have Westlink broadcasts twice a week.

Because of these ideas and the willingness of many hams we can be proud of our system, and hopefully we will have a Digital Voice Recorder in the future!"

IC-900 Performance on Hilltops

R. R. "Dutch" Ludt reports the result of a mountain top performance test of the IC-900 2-meter band unit to simulate performance as a remote base transceiver in a repeater system. He compared the IC-900 UX-29A 2 meter band unit with an ICOM IC-22U – a very popular two meter rig used on hundreds of remotes. Dutch performed this test at the top of Mt. Wilson, one of the toughest rf environments in the world – the home of most L.A. TV and FM stations and many commercial and amateur repeaters.

The antenna, feed line, and front end cavities were interchanged between the two radios.

Effective sensitivity was measured by transmitting low level signals from the ground (hand held 50 miles away) into each radio. Reading the internal s-meter on each radio gave a crude indication of sensitivity. The s/n levels sounded similar to the ear on weak signals. The two radios were about the same, with perhaps a slight edge to the IC-900.

Front-end rejection was tested by letting the IC-900 listen around the band, to low level signals from the remote handheld or other sources. The IC-900 was also allowed to just listen for interference, intermod, desense, etc. The IC-22U was then tested in a similar way. The two radios were about the same.

Dutch's conclusion (this was an empirical test) – the IC-900 and IC-22U seem to perform about equally on a very active mountain top.

We've had similar good reports from other owners of IC-900s that have driven to mountain tops to check their performance in tough rf environments.

The Ideal 1200 MHz Repeater System

Tom Vegors, WX6N reports the results of his survey of Los Angeles 1200 MHz repeater owners on what makes a top-notch system for this challenging band. Thanks for the roundup, Tom!

- ICOM IC-RP1210 repeater (see your dealer)
- Angle Linear 1272-4GN pre-amp – 12 db gain, .7db noise figure, 50Ω in/out, N connectors, lightning protection, $95; BP1272N band-pass filter strongly recommended for receiver port of duplexer in front of preamp – 3 db bandwidth of 14 MHz, loss .2db, N connectors, $75
PO Box 35, Lomita, CA 90717, (213) 539-5395
- Down East Microwave 2335PA – 10W in, 35W out 1240-1300 MHz power amplifier, $315
Bill Olson, W3HQT, Box 2310 RR 1, Troy, ME 04987, (207) 948-3741
- Tx Rx duplexer Model 28-97-01A (for open frame cabinet with center rail) or B (for flush mount front or rear of cabinet), $693(A), $712(B), less 25% amateur discount
8625 Industrial Parkway, Angola, NY 14006, (716) 549-4700
- Andrew Heliax, FSJ4-50B superflexible or LDF4-50A, both 1/2" 50Ω, available with N connectors installed; contact Andrew or dealer
Andrew Corporation, 10500 W. 153rd Street, Orland Park, IL 60462, (312) 349-3300
- Comet Antenna CA-1221S 1200 MHz antenna, $151.90; contact NCG or your dealer
NCG, 1275 North Grove St., Anaheim, CA 92806, (714) 630-4541
- And last, but not least, an ACC RC-850, RC-96 or RC-85 Repeater Controller, Digital Voice Recorder, and other ACC repeater accessories to make your repeater more fun!

1200 MHz repeaters (and in the near future, 2300 MHz repeaters) can work well but require extra attention to detail because of potential losses at these high frequencies. Truly a system design challenge!

GMRS

Amateur radio isn't the only two-way radio service available for personal communications. The GMRS (General Mobile Radio Service) offers a UHF FM licensed service for personal and public service use, as opposed to business or recreational use. With equipment similar to amateur UHF handhelds and mobiles, family members can keep in touch using this service without a Morse code requirement for licensing. Eight channel pairs are available in the 462-467 MHz range for simplex and repeaters. For more information, contact the PRSG, PO Box 2851, Ann Arbor, MI 48106, or via CompuServe "73016,163".

Spectrum Auctions

The national budget prepared by former president Ronald Reagan's administration for fiscal year 1990 (Oct. 1, 1989, to Sept. 30, 1990) recommends a proposal to auction 6 MHz of spectrum in the 800 MHz band – as have previous budgets.

Although spectrum auctions never have won congressional approval, their estimated value continues to rise. Initial administration estimates put the spectrum value at $600 million. A House bill estimated the auctions would net $800 million. The 1990 budget places the value at $2.3 billion in 1990 and $1.1 billion in 1991.

Mobile Radio Technology, April 1989.

Amateur Autopatch Update

US West (Mountain Bell) has approved residential phone rates for Amateur Radio autopatches regardless of whether they are in a commercial or business location.

The basis for Mountain Bell's decision was the fact that regardless of whether the line terminated in a commercial location or not, radio amateurs are prohibited by law from using the service for business purposes.

For further information, contact the Regulatory Information Department at ARRL HQ.

ARRL Letter, March 13, 1989

Truckers Can Ten-Four by Satellite

Truckers will soon have a new communications tool at their fingertips, one that's far more sophisticated than a CB radio. Tiny satellite antennas 6" in diameter, mounted atop trucks, let trucking companies track, locate, and communicate with their drivers, without ever making them stop their rigs to get to a pay phone. The system comes from Geostar, a Washington satellite-communications company that has offered one-way communications between truckers and their dispatchers for over a year. The new system, called Satellite System 2C, lets truckers both send data and get it from their dispatcher's office. Trucking companies can use the system to keep better track of their trucks and trailers. The system is also attracting the interest of the Defense Department – it could keep track of hazardous waste and other sensitive materials as they're transported across the country.

Electronics Magazine, March, 1989.

Goose Creek Tower Proposal

John Place, WA4HNK sends us this article from the Charleston, S.C. News and Courier, and adds that "you can fight city hall and win"!

Goose Creek Signals End to Radio Tower Proposal

The Goose Creek Planning and Zoning Commission decided last week to drop a controversial proposal to restrict the height and location of amateur radio antennas.

City Planner Tim McAuliffe said the commission is satisfied that the city's building code adequately ensures the safety of antenna towers, one of the main concerns that prompted the proposed regulations. City officials were also worried that the proliferation of antennas would create an eyesore.

"There's not a whole lot you can do about aesthetics," McAuliffe conceded.

The zoning amendment would have limited the height of antennas to 10 feet above the highest point of the home and required that they be placed in the back yard. The proposal prompted strenuous objections from amateur radio operators, who said the restrictions would severely curtail their activity, in violation of federal regulations.

"We didn't investigate it as thoroughly as we probably should have" the first time around, he said. "We're going to enforce what we already have."

McAuliffe agreed that arguments about the benefits of amateur radio had influenced the commission.

"They do provide a service," he said. "It was never the intention of anyone to totally restrict ham radio operation in the city."

Vernon Wells, assistant director for the Roanoke Division of the [sic] Amateur Radio Relay League, welcomed the decision to drop the restrictions.

"They're very supportive of the amateur radio community now," he said of Goose Creek officials. "They've learned a lot."

Programmable CTCSS

Ray Waldemar, WA6NVL reports the details of his remotely controllable CTCSS encode/decode board for his RC-85 controller based remote base. His 3 IC circuit, plus an ACC FC-1 Frequency Control Board and Comm Spec TS-32 gives him complete CTCSS control for his remote. Request a copy if you're interested.

Synthesized Speech

– Not a Real Person Inside

The speech synthesizers in our repeater controllers produce speech based on a process called Linear Predictive Coding. LPC uses a mathematical model of the human vocal tract to enable efficient digital storage and re-creation of realistic speech. Real speakers are recorded (like Romeo and Juliet) and their voices are LPC processed and the resulting data is stored in ROM, as in your ACC controller.

Speech is the result of the interaction between three elements in the vocal tract: air from the lungs, a restriction which converts the air flow to sound and the vocal cavities which are positioned to resonate properly.

The air from the lungs is expelled through the vocal tract when the muscles of the chest and diaphragm are compressed. Pressure is used as a volume control, higher pressure for louder speech.

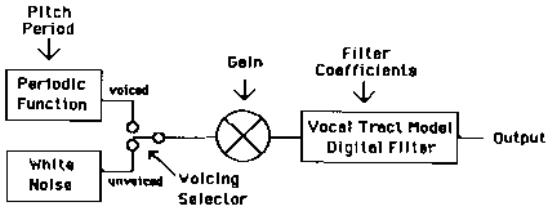
As air flows through the vocal tract it makes very little sound if there is no restriction. The vocal cords are one type of restriction. They can be tightened across the vocal tract to stop the flow of air. Pressure builds up behind them and forces them open. This happens over and over, generating a series of pulses. The tension on the vocal cords can be varied to change the frequency of the pulses. Many speech sounds are produced by this type of restriction, for example, the "A" sound. This is called "voiced" speech.

A different type of restriction takes place in the mouth and causes a hissing sound called white noise. The "S" sound is a good example. This occurs when the tongue and some part of the mouth are in close contact or when the lips are pursed. This restriction causes high flow velocities which cause turbulence that produces white noise. This is called "unvoiced" speech.

The pulses from the vocal cords and the noise from the turbulence have fairly broad, flat spectral characteristics. In other words, they are really noise, not speech. The shape of the oral cavity changes noise into recognizable speech. The position of the tongue, the lips and the jaws change the resonance of the vocal tract, shaping the raw noise of restricted airflow into understandable sounds.

The LPC model incorporates elements analogous to each of the elements of the vocal tract described above. It has an excitation function generator that models both types of restriction, a gain multiplication stage to model the possible levels of pressure from the lungs, and a digital filter to model the resonance in the oral and nasal cavities.

The figure shows the the LPC model in schematic form. The excitation function generator accepts coded pitch information as an input and can generate a series of pulses similar to vocal cord pulses. It can also generate white noise. The waveform is then multiplied by an energy factor that corresponds to the pressure from the lungs. Finally, the signal is passed through a digital filter that models the shape of the oral cavity.



The data compression for LPC takes advantage of other characteristics of speech. Speech changes fairly slowly, and the oral and nasal cavities tend to fall into certain areas of resonance more than others. The speech is analyzed in frames that are generally 20 ms long. The inputs to the model are calculated as an average for the entire frame. The synthesizer smooths or interpolates the data during the frame, so there isn't an abrupt transition at the end of each frame. Often speech changes even more slowly than the frame. LPC models allow for a repeat frame, where the only values changed are the pitch and the energy. The filter coefficients are kept constant from the previous frame. To take advantage of the recurrent nature of resonance in the oral cavity, all the coefficients are encoded, with values from three to six bits for each coefficient. The coding table is designed so that more coverage is given to the coefficient values that occur frequently.

Courtesy Texas Instruments.

MVPs For Repeaters

Reconditioned General Electric MVP Mobile transceivers can make great, inexpensive repeaters (around $400) for 2 meters and 70 cm. A source for these radios (and other reconditioned two-way equipment) is Tele-Path, 49111 Milmont Drive, Fremont, CA 94538. (800) 292-1700. In California, (415) 656-5600.

HSC Pager Update

ACC's RC-850 controller supports, among others, the HSC paging format for selective calling. Standard Communications, a former manufacturer of HSC pagers, has exited the pager market entirely. But a newly announced MR-700VH pager from Seiwa is available for VHF. Contact Mel Oelrich, Sales Administrator, Seiwa Corporation, 3131 South Dixie Dr., Dayton, OH 45439 (513) 299-2748.

What's New in HF Communications

We came across an interesting article about the state-of-the-art in HF communications in *Global Communications*, Second Quarter, 1989. Here are some excerpts from "Reliable Long-Range HF Communications", by Stefan J. Geisenheyner.

Information can be transmitted over long distances by cable, HF radio and satellites. The success of the latter has caused the other two to be neglected for a time. Once the limitations and, above all, the final cost of maintaining satellite networks became better understood toward the mid '70s, undersea cables became attractive again and increasing attention began to be focused on HF radio as a potentially competitive communication medium for specialized long-distance transmission links.

This trend has been supported by recent advances in computer technology that allow very complex control and signal-processing operations to be implemented at moderate cost. Theoretical work and practical studies carried out in the past few years have amply demonstrated that short-wave communication can indeed be made just as reliable as cable or satellite. The novel concept involves rapid digital data transmission with adaptive equalizers, adaptive frequency management and a data integrity protection system, all of which operate with fast computers and flexible software. This new approach is expected to provide in the '90s the basis for advanced HF radio equipment and peripheral systems that are capable of maintaining disturbance-free HF communications on a global level.

The main advantage of communication via HF radio is that voice, code and data links can be established on short notice over a long distance with readily available and comparatively cheap equipment.

The results of early studies and experiments [in the mid-'70s] confirmed that transmissions of information in digital format would eventually become the foundation of all modern approaches to HF radio communication.

Conventional HF communication has the justifiable reputation of being unreliable and slow. This is due to three major characteristics.

(1) Multipath propagation, meaning that the same transmitted signal may reach the receiver several times after having taken paths of different lengths [with different time delays]. This phenomenon is particularly annoying if high-speed data are transmitted, i.e. at 3 kbit/s. Due to this effect, conventional data transmission via HF radio has to be broadcast with a transfer rate at which the effect of these delays is hardly noticeable, i.e. 75 bits/s. This slow speed blocks communication channels for an unduly long time while still not assuring faultless reception.

(2) Those frequencies that can advantageously be used for HF transmissions vary with the position of the sun and solar activity. The most striking result is the shrinking of the bandwidths at night. This characteristic originating in the ionosphere has always meant – and still does – that the skill and know-how of the radio operator, as well as careful frequency planning, is of decisive importance for smooth conventional transmission via HF radio.

(3) So-called cumulative interferences. These include not only noise interferences and atmospherics, but also those disturbances caused by other HF users. These are due to the world-wide lack of radio discipline among HF radio operators and extreme range overshooting occurring mainly at night.

A concept for a modern unconventional HF station network, including measures to eliminate, or at least reduce, these disturbing effects, is currently under advanced development and testing by the West German company AEG-Telefunken. Any type of message such as voice, data, fax, telex or images can be transmitted [digitally]. Apart from providing the message, the user need only specify the address of the receiving station; everything else is performed automatically by the equipment. This level of automation is a completely new feature in the realm of HF communications. The system is based on two computerized modules which have to be installed with all partner stations in the network. Automatic transmission is handled by the radio processor ARCOTEL, modulation and demodulation by the high-speed modem ECHOTEL. Both sub-systems have been designed for easy interfacing with modern HF radio transceivers of any selected brand.

ARCOTEL handles tasks previously reserved for an experienced operator. It establishes a radio contact with the receiving station automatically, advises the partner of impending frequency changes if transmission quality on the currently used band becomes too poor and accepts frequency change commands from the partner. Unlike a human operator, ARCOTEL handles these tasks very rapidly with the aid of a semi-duplex protocol which uses regular automatic feed-back messages from the receiving station which are used for checking reception quality.

ECHOTEL is an HF radio modem that receives the digital data to be transmitted, and converts them into an audio frequency signal by means of modulation. The resulting signal occupies a 3 KHz voice bandwidth. The received AF signal is passed on to the corresponding ECHOTEL modem which recovers the transmitted data for passing on to the radio processor ARCOTEL in digital format. ECHOTEL handles a maximum of 3.2 kbit/s useful data in a 3 KHz SSB voice channel. That is over 60 times more than can be achieved with today's conventional 50 to 75 bit/s HF transmission.

In voice communications, frequency-selective fading [as a result of multipath propagation] becomes noticable in the form of distorted tone color. The deep tones fade first, followed by the higher ones, this taking place in a periodic fashion. If data are transmitted at 60 bits/s rate, transmission errors also occur in this periodic fashion. [Since a conventional 60 bits/s signal occupies a relatively narrow band,] fading cancels out the entire received signal. Since ECHOTEL occupies a full AF voice channel, only the tone quality is affected. Sometimes the low frequencies fade, sometimes the higher ones, but this has virtually no consequences regarding a clear reception of the digital datastream. This requires an equalizer module at the receiving end to recover possibly missing characters of the transmitted data stream. The adaption methods and software algorithms in ECHOTEL represent key technologies in the development of HF modems. The complex signal processing is performed by a 16-bit slice processor capable of performing 7.5 million operations per second.

ARRL Ad Hoc Committee For No-Code

A committee appointed by the President of the League issued its report recommending creation of a new class of amateur license which would not require a Morse code exam. Under the proposal, current Technician class licensees would automatically become "Technician Plus" licensees and retain all current privileges. The new class would be named "Technician", and would require passing the Novice and a revised Technician written exam. These licensees would have all amateur privileges above 30 MHz. An exception would be that 2 meter privileges would be limited to digital operation between 144.9 and 145.1 MHz, allowing only packet operation on 2 meters. Licensees would have distinctive call signs.

We're glad to see a fair, responsible, progressive proposal put forth under the sponsorship of the League. And we hope that the League's directors have the vision and courage to turn the proposal into a Petition for Rulemaking before the FCC. Action either way on the committee's recommendations are expected at the League's July Board meeting. Anyone can file a Petition for Rulemaking, but it is widely believed that the FCC would take such a proposal seriously only if the League supports it.

Tell your director what you think!

Support Newsline

If you play the weekly Newsline broadcast (formerly Westlink) over your repeater, or you listen to it each week, they need your help. Send a contribution to help keep them on the air. Send it to Newsline, c/o Dr. Norm Chalfin, K6PGX, POB 463, Pasadena, CA 91102.

Technical Support Line

Once again a reminder that our Technical Support Service is available for assistance weekdays between 9 a.m. and 12 noon, and between 12:30 p.m. and 3 p.m. Pacific time. The number is (408) 727-3414.

We can be most helpful if you have your manual in front of you when you call. It can also be helpful to have access to your repeater over the air to help us diagnose your problem. acc