

FEB 72

the Groundwave



EDITOR MIKE BRYAN
PUBLISHER - LARRY EMMERSON

**A PUBLICATION OF
THE OTTAWA AMATEUR RADIO CLUB**

"GROUNDWAVE IS THE OFFICIAL BULLETIN OF THE OTTAWA AMATEUR RADIO CLUB, AN ASSOCIATION OF RADIO AMATEURS DEVOTED TO THE PROMOTION OF INTEREST IN AMATEUR RADIO COMMUNICATION AND EXPERIMENTATION IN THE OTTAWA REGIONAL AREA, AND TO ADVANCEMENT OF THE TECHNICAL COMPETENCE AND ACHIEVEMENT OF CLUB MEMBERS."

CLUB ADDRESS: Ottawa Amateur Radio Club,
Box 8873,
Ottawa,
K1G 3J2

The club holds regular meetings on the first Wednesday of each month, between September and June inclusive. Meetings are normally held at the National Research Council Auditorium, 100 Sussex Drive, Ottawa. Visitors are always welcome at these meetings.

C L U B N E T : 20:00 HOURS MONDAYS

Check into the Capital City Net, via the VE2CRA club repeater, each Monday evening at 20:00 hours. VE2CRA has input and output frequencies of 146.460 and 146.940 MHz respectively.

OTTAWA AMATEUR RADIO CLUB EXECUTIVE FOR 1971-72

PRESIDENT:	Tony Vandenbelt - VE3FXG --	699 Trojan Ave., 745-6928
VICE PRESIDENT:	Colin Rowe - VE3AZY --	2310 Fox Cresc., Apt. 707 728-9240
SECRETARY:	Hank Harley - VE3BR --	Orleans 824-3895
TREASURER:	George McCullum - VE3DIH --	2299 Alta Vista Dr., 733-3600
DIRECTORS:	Larry Kayser - VE3QB --	59 Westfield Cresc., 829-3407
	Mike Waters - VE3BYO --	1045-159 Morrison Dr., 829-2762
	Larry Emmerson - VE3GGA --	883 Dunlevie Ave., 728-7307
	Ray James - VE3CUA --	43 Ashburn Dr., 221-7243

SIXTH REGULAR MEETING---1971-'72 SEASON

DATE: Wednesday, February 2, 1972

TIME: 8.00 p.m.

PLACE: Main Auditorium, NRC Building, 100 Sussex Drive

--AGENDA--

1. Call to Order
2. Welcome to Members and Guests
3. Minutes of January Meeting (attached)
4. New and Old Business
5. Reports
6. Program: TELESAT CANADA -- A Program you miss't Miss!

"ANIK," Canada's first domestic communications satellite, is scheduled for launching late this year by Telesat Canada, the unique public-private corporation which will own and operate the geostationary package, containing some of the most sophisticated and up-to-date solid state technology Canada has ever produced. Anik will be a boon to Canada's northland, bringing network television to isolated areas. It will carry east-west telephone and video services for the Trans-Canada Telephone System and other common carriers. It will do much more. Harry Kowalik, manager of satellite control for Telesat, will visit the OARC to talk about the background and objectives of Telesat. Harry's area of concern is getting the satellite into proper orbit once it has been launched---and keeping it operating properly in that orbit. He'll have an audio-visual presentation with a wealth of interesting information.

YOUR EXECUTIVE IS HOPING FOR A FULL CLUB
TURNOUT FOR THIS VERY SPECIAL PROGRAM.

ADVANCE NOTICE:

K1PLP, Jerry Hall, of American Radio Relay League Headquarters in Newington, Connecticut, is on a Canadian tour. He will be in Ottawa to visit the OARC on March 28. That's a Tuesday. Plans call for a special club meeting to hear a technical talk from Jerry on the subject of ICs. More of this at the March meeting and in next month's GROUNDWAVE.

NEXT MONTH IN GROUNDWAVE:

More on Digital Logic by Colin Rowe; the latest word on FM activity in Western Canada and something of special interest to anyone struggling with a Motorola "Handi-Talkie"---Substitution of FETs for tubes in the CP33AAC Receiver, by Ken Scrivens, VE3AFO.

MINUTES OF THE FIFTH REGULAR MEETING FOR 1971-72

Wednesday, January 5, 1972

THE regular monthly meeting of Ottawa Amateur Radio Club was held Jan. 5, 1972 in the auditorium of the National Research Council Building, 100 Sussex Drive. The meeting was called to order by the club president at 20:10 hours.

The president extended a welcome to the following guests:

VE3GBE (Wally)

VE3CXE (Mel)

A special welcome was extended to our youngest visitor since the age limitation for licensed amateurs was removed----Charles Vandebelt, junior op from the home of our president.

THE minutes of the last meeting having been circulated in The GROUNDWAVE, the president called for a motion to adopt. Vern, VE3PY, so moved and Nick (VE3FFW) seconded the motion.

CARRIED

Reports from committees were then called for:

Ray James, construction group chairman, reported all outstanding parts for the kits were now on hand and crystals had been ordered for those who had presented payment to the treasurer.

Mike, the GROUNDWAVE editor, reported the business of producing the bulletin was well in hand. He indicated that publisher Larry, VE3GGA and Larry's brother had worked extra hard to get the January edition printed and mailed on time, to ensure it was received by the post office in time to ensure delivery prior to the meeting. Mike indicated a vote of thanks might be due Larry and his brother for their efforts. The membership indicated its pleasure with a loud round of applause.

Cliff Moffett reported all was well with beginners' classes.

THE president announced that both CW and Phone co-ordinators had volunteered for the next field day club organization. Cited as having offered their help in one way or another were: VE3s: DTC, DJT, GSA and VE2NM. It's expected these members will hold an organizational meeting later this month (January).

A recent incident outlined by the president had to do with TVI:

It appeared that Larry, VE3CRX, of Orleans, had been given "silent hours" orders because of a serious case of interference involving a local CATV company. As a result of an appeal to the management of the Skyline Cablevision company, and through the efforts of its chief engineer, Sandy, VE3AAC, the source of the problem had been identified as a faulty cable distribution system which was duly cleared up. Larry had accordingly been re-instated into full privileges. Tony made a point of stating that the present liquid state of the club's assets might well be needed if litigation should ever result from such a case of TVI.

It is anticipated that a staff member from ARRL will be in Ottawa for an official visit towards the end of March. It is anticipated that if the visit materializes, a special Tuesday evening meeting may be called.

The president stated he had had a talk with one John Bolas of Canadian Time and Leisure consultants. It seems Mr. Bolas was interested in obtaining information on the suitability of our hobby as a leisure hour pastime.

A letter from ARRL was placed before the membership. The League offered renewals of membership through the club at regular rates, of which the club could retain 50%. It was tentatively stated that those desirous of renewing memberships in this manner could do so through the club treasurer.

Jim Strain spoke briefly on RSO matters. In particular, he expressed a desire to have nomination of RSO directors placed in the hands of members and affiliated clubs, rather than as at present. He also announced establishment of a net called "ONTARS," By RSO, to provide a monitoring service similar to that offered by the U.S.' EASCARS and WESCARS nets. Frequency for ONTARS is ~~3755~~ 3775 Khz.

VE3AUM was introduced to the membership. He is the newly-elected president of the Mobile Club.

John Henry, newest OARC member to get his call, was also introduced. John is VE3GDV.

Larry Kayser, program chairman, then introduced Art Hewitt, VE3CHJ, of RACAL (Canada) Ltd. Art had brought along with him two of his company's latest products: a 25-watt SSB/AM SS 10-channel transceiver and an SS successor to the famous RA-17. Following a lecture and demonstration, the meeting closed at 21.30 hours for coffee and ragchew.

HENRY HARLEY,
Secty.,
Ottawa Amateur Radio Club

GROUNDWAVE STILL SEEKS YOUR VIEWS:

One of the greatest enemies of an effective amateur radio club, let alone ANY volunteer, non-profit or similar organization, is member apathy, as Tony, your president pointed out in his message last fall. A membership that sits on its hands while others carry the ball isn't doing much to better either this hobby-at-large or this club. GROUNDWAVE has been attempting to stimulate discussion and interest on a number of topics. We've been successful in attracting a few views from various people and we're grateful to them for making this a more effective club bulletin. If there's something you want to say, remember: GROUNDWAVE is the clear-channel, QRM and QRN-free 'soapbox' of any OARC member who has a point of view he wishes to express. How about it? Something irking you? Have you got a few ideas for the club, DOC, RSO, CARF or ARRL? Address your letters to: GROUNDWAVE editor, OARC, Box 8873, Alta Vista Post Office. Over to you!!!

--VE3CGT, Editor

DIGITAL LOGIC

By
Colin Rowe,
VE3AZY

PART #4 OF A SERIES:

In a previous article I discussed the R-S flip-flop.

It was pointed out that this device could be put in either of two stable states by simply applying a pulse to a set or a re-set line. The J-K and type D flip-flops are devices similar to the R-S. They have two stable states. But with this major exception they are different: The transition from one stable state to the other only occurs if a signal on the toggle input drops---abruptly---from a positive voltage to ground. This means we can "program" the operation of this flip-flop, independently of when the actual change in state takes place.

THE J-K FLIP-FLOP:

The RTL version of a J-K flip-flop typically consists of 15 transistors. Rather than draw the internal circuitry of such an integrated circuit, we'll consider only the symbol shown below. We'll discuss its operation with respect to obtained outputs with various input conditions.

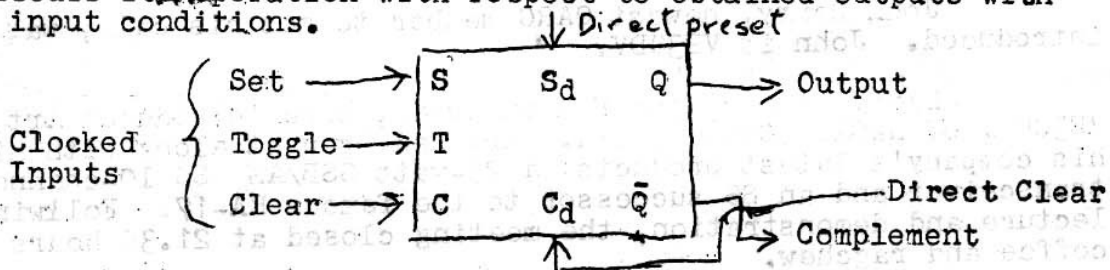


Fig: 4-1 Symbol for a J-K FLIP-FLOP

Unlike the R-S flip-flop, the J-K can be made to count. The effects of a direct input are immediate and dominant: They behave just like the inputs to an R-S. The clocked inputs are used together. The set and clear inputs condition the flip-flop to what is to happen later on, but they do not change its state. Later on, a sudden change in the toggle input from a positive level to ground brings about the change in the flip-flop condition that the set and clear inputs periodically set up. In practice, most J-K devices lack a direct pre-set input, in order that two J-Ks can be accommodated in a single 14-pin dual in-line package. However, in many cases it is possible to add a pre-set line, if one does not exist, by connecting the output of an NOR gate to the Q terminal of the J-K, as indicated below in Fig. 4-2:

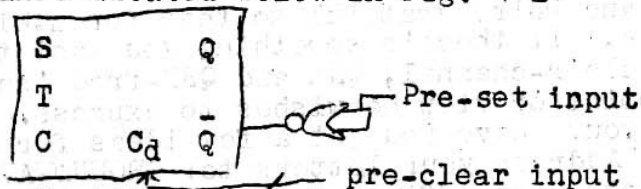


Fig: 4-2 Method of adding pre-set input to many J-K flip-flops.

FUNCTION OF DIRECT INPUTS:

The "pre-set" and "pre-clear" inputs operate in much the same manner as the "set" and "re-set" inputs to an R-S flip-flop: 1. If both the preset and preclear inputs are grounded, the flip-flop will not change state, unless acted upon by the clocked inputs. 2. If the pre-clear is made positive and the preset grounded, the flip-flop assumes the state with the \bar{Q} output positive and the Q output grounded. 3. If the preclear is grounded and the preset made positive, the flip-flop assumes the state with the \bar{Q} output grounded and the Q output positive. 4. If both preclear and presets are both made positive, the flip-flop will go into a "disallowed" state, with both Q outputs grounded. These rules of operation of the direct inputs can be re-written as the following positive logic chart, Fig. 4-3:

S_D	C_D	Q	\bar{Q}	Clocked Inputs Operational?
0	0	Q	\bar{Q}	YES
0	1	0	1	NO
1	0	1	0	NO
1	1	0	0	NO

disallowed

Fig: 4-3 Truth Table for Direct Inputs of J-K Flip-Flop.

FUNCTION OF THE CLOCKED INPUTS:

For this case, we assume the pre-set and clear lines are grounded, in order that the flip-flop will operate under the clock commands. The following operations take place with the set, clear and toggle inputs: 1. If both the set and clear inputs are made positive, nothing will happen to the flip-flop as the toggle input suddenly goes from positive to ground. 2. If the set input is made positive and the clear input is grounded, the flip-flop will go into the state with the Q output positive and the \bar{Q} (-) output grounded on the negative-going toggle transition (positive to ground). 3. If the set input is grounded and the clear input is made positive, the flip-flop will go into the state with the Q output grounded and the \bar{Q} (-) output positive. 4. If both the set and clear inputs are grounded, the flip-flop will automatically change output state every time the toggle input drops from the positive to ground. These rules are summarized in the following positive logic truth table, Figure 4-4:

S	C	Q	Q (-)	
1	1	Qn	Q (-)n	←---output remains same
1	0	1	0	
0	0	Q(-)n	Qn	←---output inverts
0	1	0	1	

Fig: 4-4 Truth Table for Clocked Inputs of J-K Flip-Flop

/..CONT

The last clocked mode finds many applications as frequency dividers (to be discussed later).

THE TYPE 'D' FLIP-FLOP:

If we were to add an inverter to a J-K flip-flop, as shown below in Fig 4-5, we form a type D flip-flop. This means there is only one clocked conditioning input:

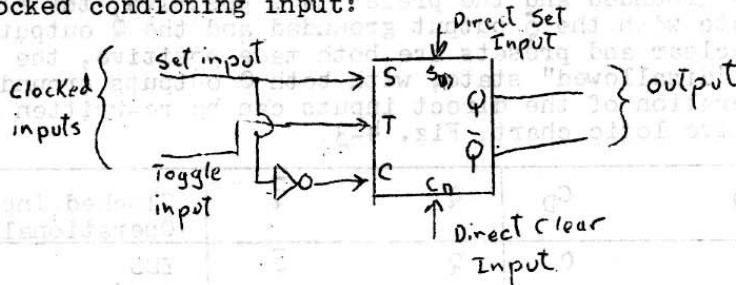


FIG: 4-5 Type 'D' Flip-flop

By this addition, however, the 1, 1 and 0, 0 inputs on the set and clear lines are eliminated, meaning that we can't inhibit the type D as we could the J-K. At first sight, we'd say that we can't make the type D divide as the J-K will either. But we can 'trick' the D into a divide configuration. (With the proviso that we can't start or stop dividing on command, as we could with the J-K flip-flop. The major use of a type D is that of a shift register, where a binary word is to be entered into a register in parallel bits that will be read out serially. It is often used for storage, during a count cycle in a frequency counter. The transfer pulse "loads" the information from the counter chain into a series of type D flip-flops for display while the counter chain is reset and begins counting again. One major difference with the type D, compared with the J-K, is that the toggle input must be high when the direct inputs are used.

BINARY COUNTERS:

Referring back to the J-K, I mentioned that with the set and clear terminals grounded, the flip-flop changes state on negative-going transitions only. This implies that the output at either the Q or Q (-) terminal is exactly 1/2 the incoming frequency, as indicated below in Fig. 4-6, since two incoming pulses must pass before the output returns to its original state.

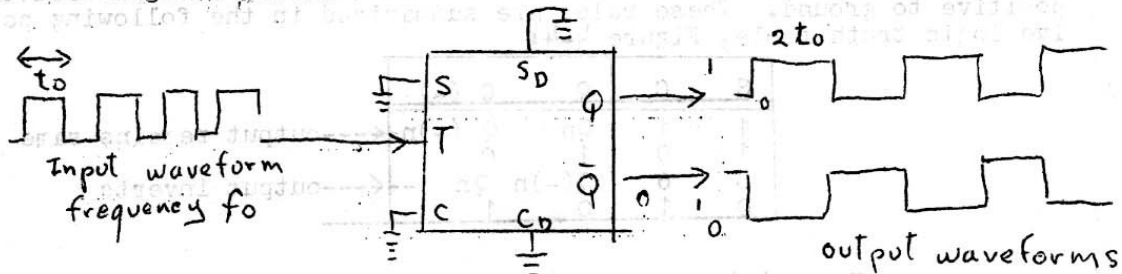


Fig 4-6 - Basic Frequency Divider

We can couple J-K flip-flops together to form binary counting chains. If there are N such binary counters coupled together, the input pulse is divided by 2^N , i.e. for 3 binary counters, the input is divided by $2^3=8$.

DECIMAL COUNTERS:

Suppose we were to couple 4 J-k flip-flops together in a binary chain, with a gating arrangement such that after the 10th input pulse, all flip-flops would be set back to zero and begin counting again. Such a chain arrangement is depicted in Fig.4-7:

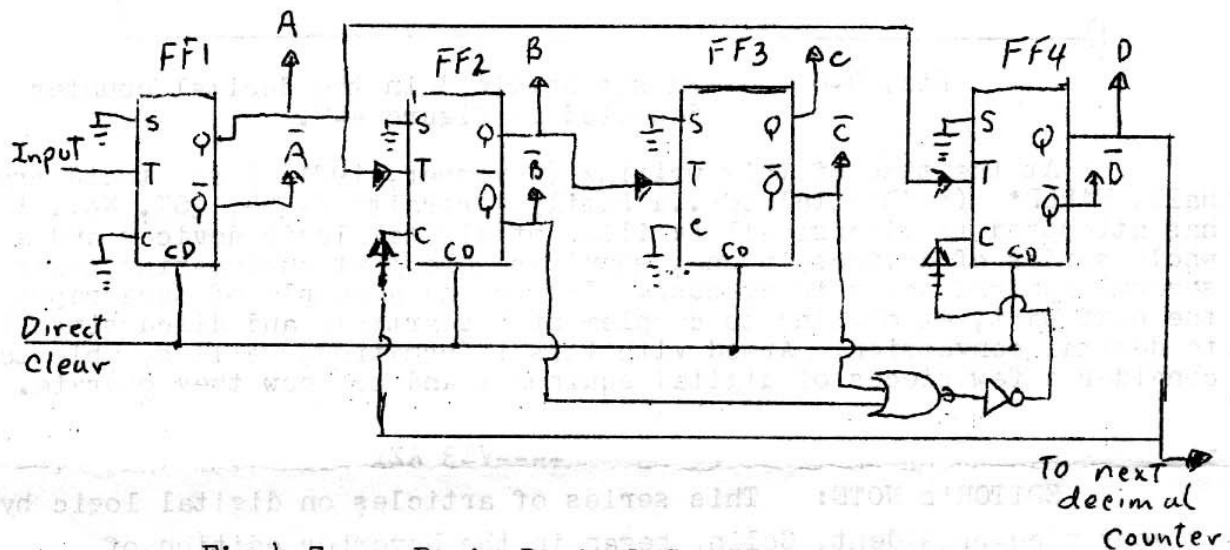


Fig 4-7 - Basic Decimal Counter

The first J-K, FF1, is simply a $\div 2$ counter; the other three in conjunction with an NOR gate and an inverter form a $\div 5$ counter. The combination produces a decimal ($\div 10$) counter whose operation is as follows:

Initially, the direct clear line is made positive--setting all the Q outputs low, and is then grounded. The first FF simply acts as a binary counter, so we'll discuss only the following $\div 5$ counter. After being reset, the output of FF4 is low so that the clear input to FF2 is initially at ground, enabling it to act as a binary counter. And the B(-) and C(-) outputs are high, so the D output is forced to remain low. After 8 input pulses, both B(-) and C(-) outputs go low, enabling FF4 to start counting and forcing the clear input of FF2 high, thus keeping B(-) and C(-) outputs low. After an additional 2 clock pulses, the D output of FF4 goes low, allowing FF2 to again count and forcing the clear input to FF4 high, i.e. re-setting its D output to ground. We're again ready to count another 10 input clock pulses. Such a system with binary (base 2) outputs resetting on the 10th (decimal) pulse forms only part of a more general electronic system called binary-coded-decimal, or "BCD," for short. In order to aid your understanding of the decimal counter, I have indicated the waveforms one would attain at points A, B, C and D in the decimal counter system as shown in Fig 4-8:

(See Following Page)

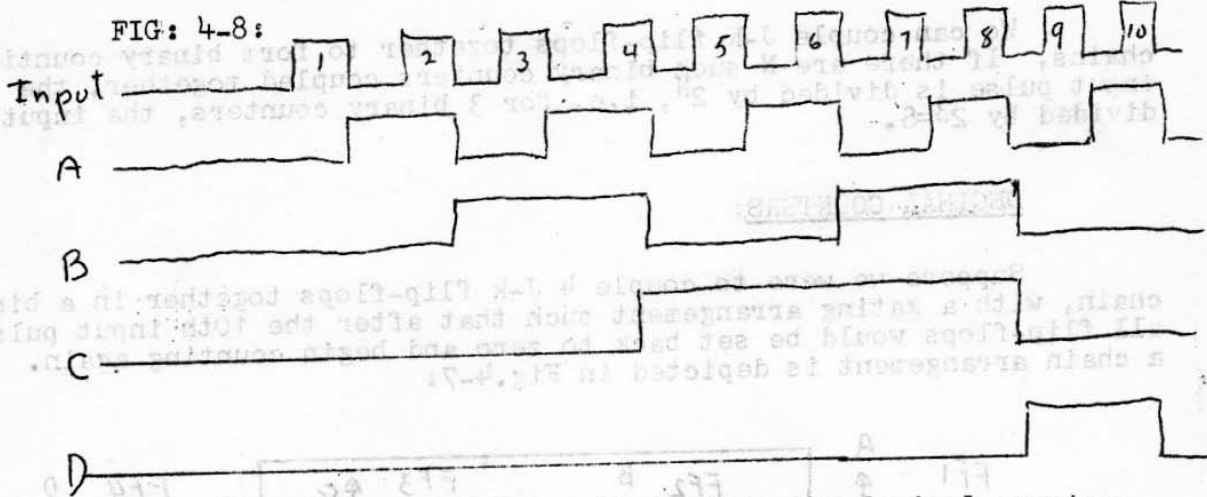


Fig. 4-8 - Pulses obtained in the decimal counter depicted as figure 4-7.

At the time of this writing (November, 1971) I see that Jerry Hall, K1PLP* (* "Digital ICs...a Family Portrait" P. 24, QST, Nov. '71) has attempted to discuss all families of digital logic devices and a whole series of devices in one, short article that engineering texts take several hundred pages to discuss. I'll spend a couple of paragraphs in the next part, attempting to complement his article and discussing BCD to decimal conversion. Armed with this information, we'll be able to consider a few pieces of digital equipment and see how they operate.

----VE3 AZY

EDITOR'S NOTE: This series of articles on digital logic by your vice-president, Colin, began in the November edition of GROUNDWAVE. The series will be continued next month. If you have any questions for Colin, arising out of the series, he has indicated a willingness to discuss them towards the end of the series this spring. Address correspondence directly to VE3AZY at the address shown on the inside front cover of GROUNDWAVE.

--VE3CGT

SWAP NET REMINDER:

In the market for a new rig? Want to get rid of that piece of junk that's been collecting dust in the shack while you looked for the extra bucks to buy something new? Or maybe you're a beginner, looking for a better receiver for code practice. Got something to swap, maybe? The answer to your particular amateur marketplace problems may be found on 3760 Khz (SSB) Saturdays at 10 a.m. or at 20:00 hours local time Monday evening, as part of the OARC's Capital City Net, via VE2CRA, the club's 2-metre FM repeater. Ed and Doreen Morgan, VE3GX and VE3CGO, operate a "Swap Net" service for one and all. 3760 Khz is where you'll find the Ottawa Valley Mobile Radio Club (ING.) gang's "Pothole Net," of which the Swap Net is a regular feature. To list an item for sale, wanted or swap, just call the Morgan QTH at 733-1721, or, if beyond the Ottawa toll area, call VE3CGO on either 3760 or 146.940 (Mhz). Items are normally listed for one month, unless otherwise cancelled or renewed.

REPEATER COMMITTEE NEWS

-- (From Minutes of two recent meetings) --

The repeater committee met Oct. 14 at 8 p.m., with VE3BYO, Mike, chairing the proceedings. Present were: VE3s AZY, BTS, BNO, DHB, DTC, FFW, QB and VE2NM. This meeting dealt entirely with identifying and organising priorities for repeater group projects. These priorities were established as follows:

1. Re-activation of the 450 Mhz Repeater
 - 1.1 --New Antenna to Be Built
 - 1.2 --Receiver to be re-tuned
 - 1.3 --Diplexer: Retune one of two available
2. 2-Metre Improvements
 - 2.1-Improve present receivers, both primary and back-up
 - 2.2-Install a solid state receiver
 - 2.3-Zero Beater Circuit: ("Road Runner")
 - 2.4-Activate a Remote Site
 - 2.5-Design and build a solid state control circuit
 - 2.6-Investigate a new shut-down timer

The group got together again Dec. 14 at VE3FFW's QTH, with Nick, Colin (AZY), Sonny (BTS), Al (DTC), Mike (BYO) and Clarence ('2NM) all present for the meeting, chaired by VE3BYO. Sonny and Al reported a collinear 450 Mhz antenna had been built and was ready for installation. The 450 receiver had been re-tuned. But retuning of the diplexer would cost \$100 and, to date \$67 was all that was on hand. VE3QB was investigating a possible trade of one of the diplexers for the balance required. In line with a recent decision of the OARC executive, it was agreed funds would not be solicited for this purpose. It was agreed advantages of a diplexer did not justify disbursement of club money for retuning, so the remaining unit will remain with VE3BYO until it is needed. Receiver improvements on the 2-metre setup had been effected and a solid state receiver was ready for installation. It was questioned whether a remote receiver was needed yet. VE3AZY believed that with the present control circuitry, it would not be possible to add one without degrading output audio quality. Consensus of opinion was to install the receiver at the main site as a standby unit until a remote site was re-activated. VE3AZY presented a complete zero-beater unit lacking only four parts. VE3FFW agreed to look into their procurement. Colin noted that the present control circuitry in use would be incompatible with the new device. Colin also presented plans for a solid state control circuit he estimated could be built for around \$15. VE3FFW agreed to look into parts procurement and such other aspects as a rack panel.

Turning to NEW BUSINESS, the meeting was advised by VE3BYO that Bell Canada might authorize "autopatch" operation, should the VHF group want to institute it, but the committee felt there would be too many potential problems, particularly with the great number of users of VE2CRA and also taking into consideration the fact that their very numbers virtually eliminated the need for any such device. It was agreed to drop the matter.

TONE ACCESS of some sort was then discussed, but most felt that restricted access would not help our operation on 2 metres and would make use by both visitors and newcomers more difficult.

/Cont'd

REPEATER NEWS - (Continued)

Looking at the national situation with respect to 2-metre FM repeaters; it was felt that some national body---possibly CARF--- could effectively reduce overlap problems through co-ordination and planning. For example, an off-channel master input frequency. (I.E., 146.100 priority input; 146.460 secondary input, as a national standard.)

FUTURE OF REPEATERS?

As discussion turned to the future and possible paths of development, two points were made:

1. Standardized deviation might emerge, both on a local and on a national basis.
2. As a general principle, an area should have one, broad coverage repeater---rather than a situation in which several communities within a local area each have their own, less effective installations, with resultant and inevitable problems of overlap.

0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -

AN IMPROVED MODULATOR FOR THE QST

"P I P S Q U E A K"

By
V E 3 E Q H

The original pipsqueak modulator, as I first used it, had a number of faults. The first one was that it needed a pre-amp if you didn't use a carbon mike. The second was that it produced a lot of hash, which, when viewed on a 'scope produced quite the picture! My first effort to cure the problems was installation of a toroid filter circuit before the output stage of the modulator. It removed the hash but also took out all the high frequency components of the voice, leaving a very bass sound. The most recent try has been more successful: It involves removal of the diode clipper circuitry composed of C-32, C-33, Cr-4 and 5 and R-16, 17 and 18. (Refer to QST, March, 1971). Page 23. Connect the hot end of R-15 to the negative end of C 34. A pre-amp will be needed, particularly if you are using a low-output microphone. I use an FET pre-amp with a matching transformer between it and the mike (Hammond 145-0). A pot is employed across the secondary of the transformer, the centre tap of which feeds the J-FET. The pre-amp connects in place of R-11 and C-28.

After these modifications have been done, the deviation pot, R-23, may have to be re-set. You may find that due to lack of hash you can run at a higher audio level without exceeding 15 Khz deviation limits. And you will be more easily understood.

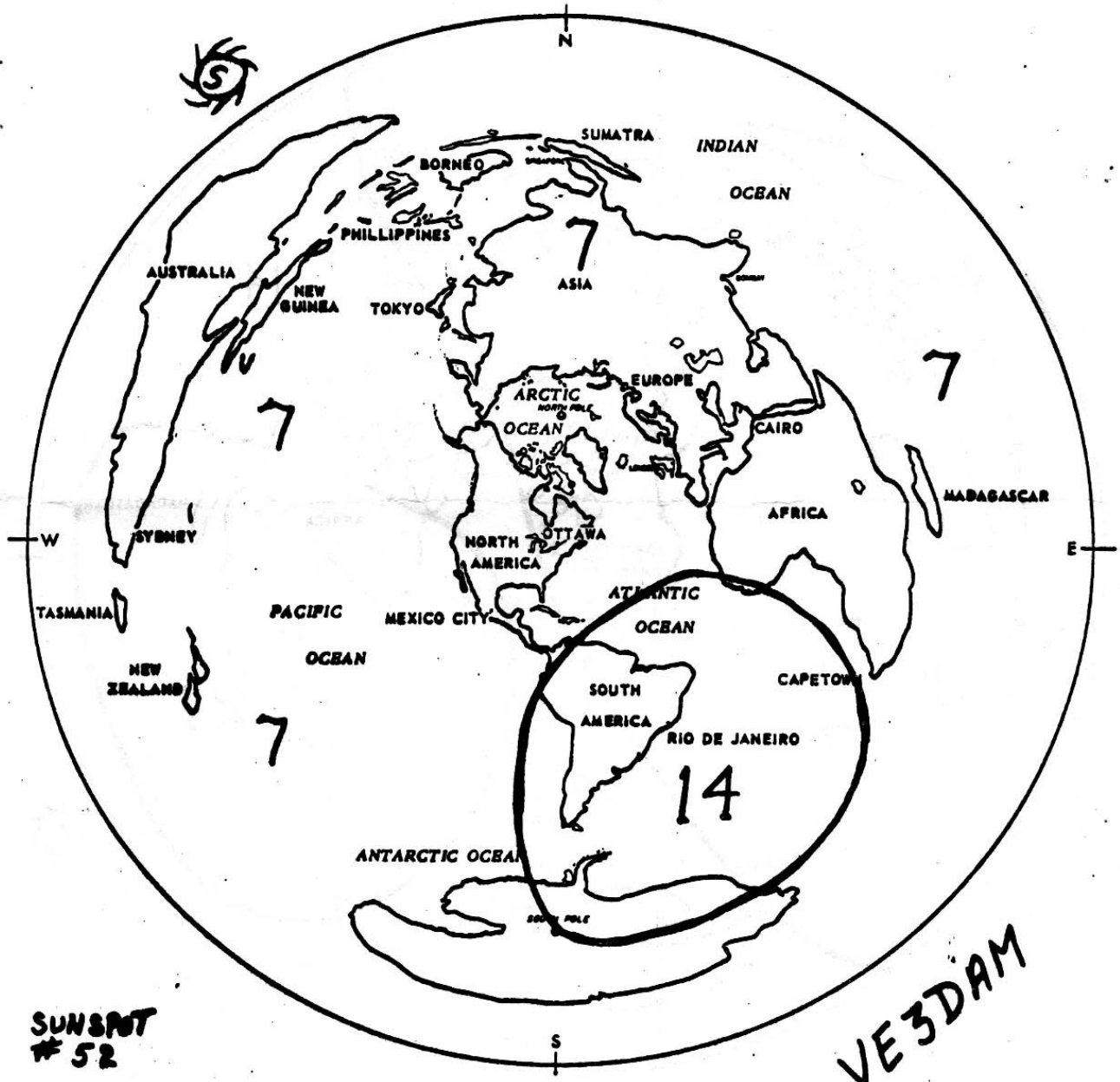
--VE3EQH
George Acton

EDs note: Tip of the hat, boys, to George:

He was the first one in our area to successfully master the Pipsqueak and, as far as we know, is the only one regularly operating the tricky little QRP rig. If anyone else has one on the air, or close to operational status, we'd appreciate your comments on the rig for the G'WAVE.

0600 GMT - FEB. 1972

AZIMUTHAL EQUIDISTANT PROJECTION OF THE WORLD
(POLE OF PROJECTION AT OTTAWA)

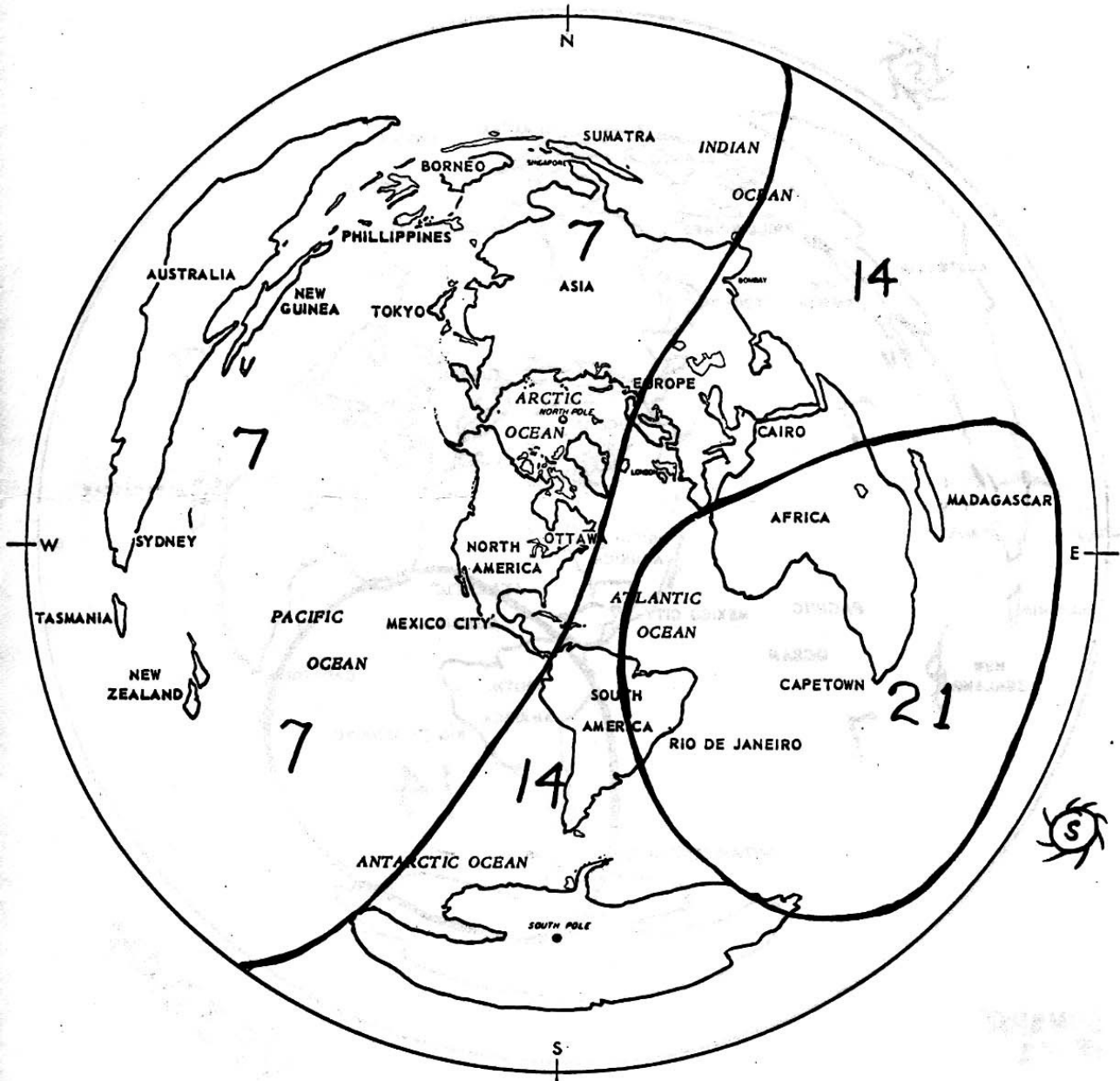


SUNSPOT
52

OIDD EST

1200 GMT - FEB. 1972

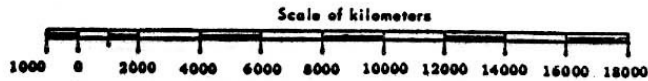
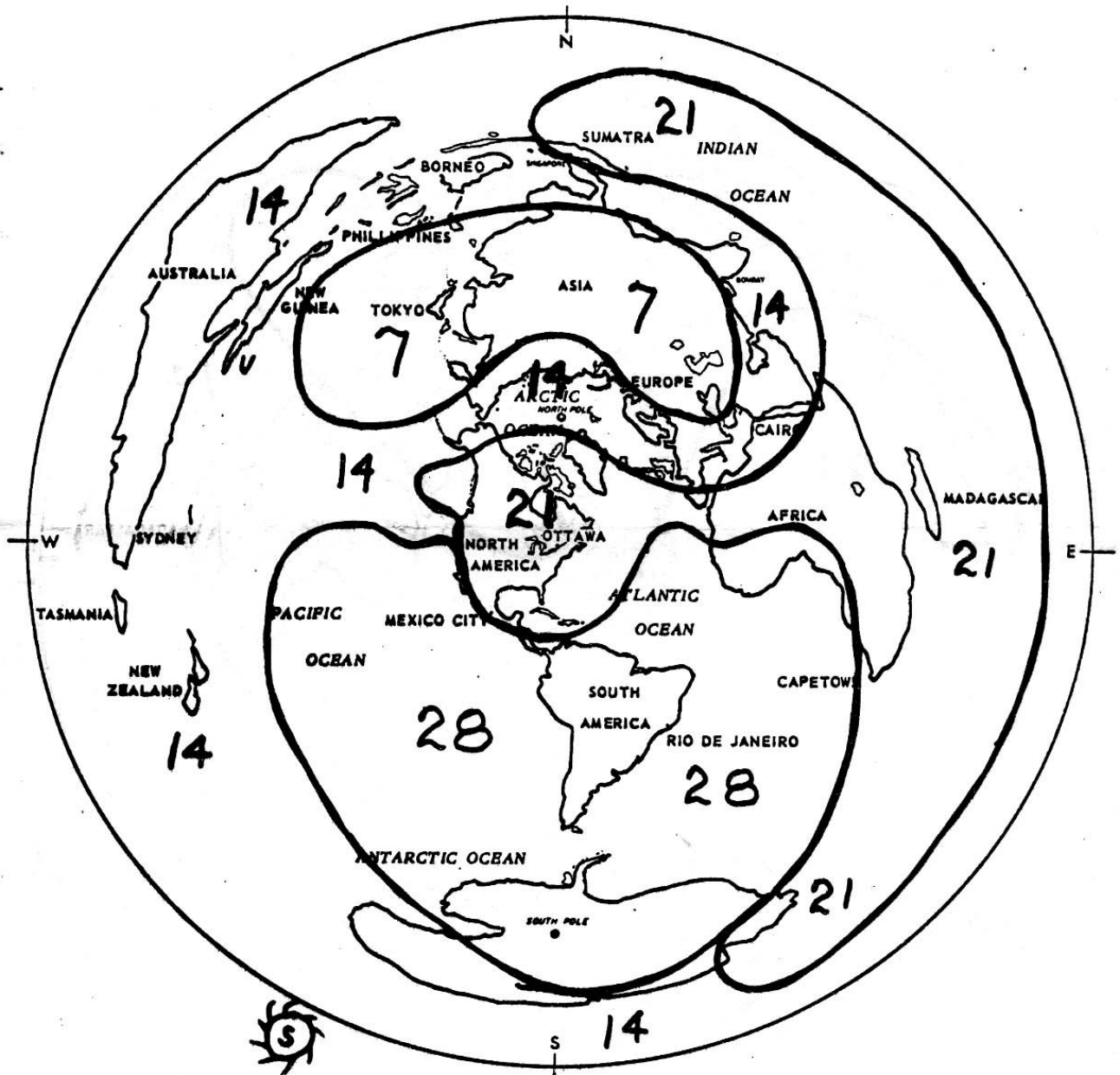
AZIMUTHAL EQUIDISTANT PROJECTION OF THE WORLD
(POLE OF PROJECTION AT OTTAWA)



0700 EST

1800 GMT - FEB. 1972

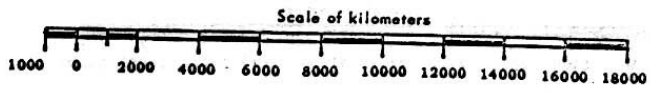
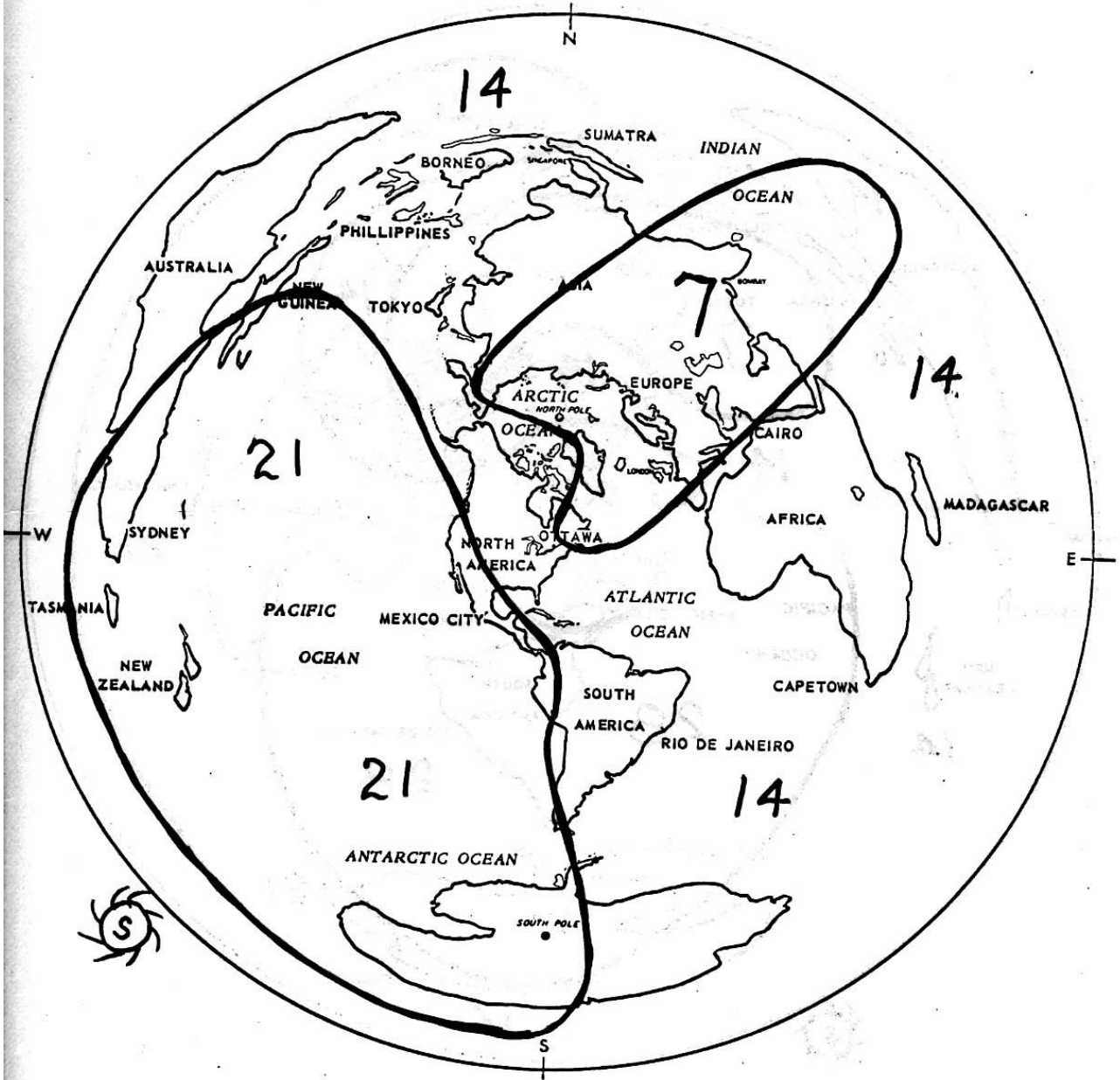
AZIMUTHAL EQUIDISTANT PROJECTION OF THE WORLD
(POLE OF PROJECTION AT OTTAWA)



1300 EST

0000GMT - FEB. 1972

AZIMUTHAL EQUIDISTANT PROJECTION OF THE WORLD
(POLE OF PROJECTION AT OTTAWA)



1900 EST.

SUBSTITUTING FET'S FOR TUBES IN THE MOTOROLA

HANDI-TALKIE CP 33AAC RECEIVER

KEN SCRIVENS VE3AFO

With a very limited knowledge of the why's and wherefore's of FET's and knowing full well that "fools jump in where angels fear to tread", I decided to try to eliminate the tubes in the receiver section of one of my recently-acquired pair of Handie-Talkies.

Following are some notes on my approach to the problem.

First, my choice of FET's was made on the basis of being "on hand". I decided to convert one stage at a time, starting with V_2 , the 1st IF 2nd stage. After first aligning the receiver (as per the manual) and getting a sensitivity figure to start from, the V_2 tube socket was removed from the board. I found that the tube socket had to be sacrificed to remove it and not disturb the PCB conductors.

The FET's come with a shorting wire ring on the leads. This should be left on until the device is soldered into position. DO NOT use a soldering gun! Fig. 1 shows the placement of the 3N128, utilizing the socket mounting holes. C_{13} (top side) was retained as the source bias resistor by-pass, and the $B+$ resistor, R_4 , removed. This provided a tie-point for mounting the source and gate resistors to -6 VDC.

This point is by-passed to gnd. with a .01uf disc ceramic (short leads).

Be sure to clear the fil. and $B+$ feeds to this area (and the others as you go along). As shown in the sketch, some buss wire strapping is required to ground L_6 , pin 4 conductor, which is now also the case and substrate of the 3N128.

Test results were good. There was, however, a tendency for the stage to oscillate, but by changing the value of the source bias resistor this was overcome and the original sensitivity achieved.

I then decided to try a dual-gate MOS FET in place of the diode mixer and V_f set-up. Fig. 1, again, shows the changes in that area.

Carefully remove the tube socket V_1 . (There goes another one, no turning back now!)

The placement of the 3N141 is such that C_9 is retained as a source bias by-pass and again the $B+$ feed point becomes a tie-point for the G_1 , G_2 and the source bias resistors. Pin 1 of L_4 is buss wired to ground and the existing conductor cut as shown. The remaining

portion of this conductor becomes the drain connection of the 3N141 and is connected to pin 4 of L4. A .001 uf condenser connected from L3 pin 1 to G₁, couples the input signal. The L.O. signal is coupled from T2, pin3 through a .001 uf to G₂ of the 3N141. A 10 pf padding condenser across L4 was required for peaking.

The diode mixer circuit and T1 are not used. The connection from L3 pin 1, to the diode CR1, should be removed. Once again results were encouraging and an improvement in sensitivity of about 1 db was measured over the tube and diode mixer set-up. A pair of diodes (1N56A) were connected across the G₁ resistor to provide protection against strong signals and transients.

Next came the conversion of the Xtal oscillator stage. Tube socket V₃ was removed. Resistor R6 (top) was removed and placed on the other side of the board to tie to -6 VDC along with the source bias resistor. Capacitor C29 is retained, again as the source resistor by-pass. Ground the B+ end of L22. The resistor R8, in the schematic diagram in the manual, is shown going to ground. In both of my units it actually returned to +1.5 VDC, the filament line! This puts a reverse bias on the diode multiplier. I found, however, with my diodes, that returning R8 to the source resistor and forward biasing the diode, increased the output from the multiplier. I found that a 5 pf padding capacitor was required with the Xtal from CTS.

The output from the oscillator is down somewhat from the tube circuit, but does give adequate drive to the mixers as shown by the results.

The overall sensitivity was measured at 0.7 to 1.0 microvolts for 20 db of quieting at 146.94 MHz.

The second unit underwent the conversion in one big step. After considerable difficulty in re-aligning, the results were as good as the first attempt. For this reason, again I recommend a stage by stage approach.

The -6 VDC drain is approximately 30 MA squelched and 200 - 350 MA with received signals. I am powering the handie-talkie with a 6V, 4AH, NI-CAD battery and a home brew transistor supply provides B+ and 1.5 VDC filament voltage for the transmitter section. There is also a built in battery charger for base station use and over night recharging.

A future article could cover the power pack, if there is any interest.

C O M I N G
S O O N

ANOTHER PRICE- SHATTERING
HEATHKIT COUNTER - THE
NEW 1B-1101 WITH 100 MHz
CAPABILITY FOR JUST \$ 335.00

The HEATHKIT 1B- 1101 frequency counter is a truly low- cost unit in kit form, with a 100 MHz capability and a list of features to rival many high- cost counters.

By use of an exclusive Heath designed input circuit capable of operation with less than 50 MV or more than 200 V input without damage, we now offer a full 5 digit unit. This can be expanded to 8 digits by use of the over- range circuitry.

Designed for years of trouble free service, the unit incorporates the solid state circuitry with cold -cathode readout tubes for instant operation. Other features include count storage circuitry for non- blinking read-out, a time base crystal for rigid stability, a dual primary power transformer and a well regulated supply assures stable operation with accuracy of better than +3 PPM from 17 degrees to 32 degrees centigrade.

The unit requires only 2 initial adjustments which can be made by use of the built- in level source and a standard AM Radio.

The 1B-1101 is housed in a lightweight aluminum case with a Zinc die-cast front panel and featuring a tinted viewing window, BNC connectors and a tilt- stand handle.

FOR FURTHER INFORMATION ON THESE OR ANY OTHER HEATH
INSTRUMENT, CONTACT

HEATHKIT
Schlumberger

MISSISSAUGA ONTARIO



K1G 1M2

FIRST CLASS MAIL