A FIRST LOOK AT THE FULLY AUTOMATED McKAY-DYMEK DR-333

John Bryant

INTRODUCTION

We did not realize it in the late '70s, but the arrival of receivers using purely solid state frequency control opened the door to an ever-expanding world of receiver automation. The first strides in this direction were "memory channels" offered on SONY's ground-breaking ICF-2001 portable. This was followed rapidly by similar "frequency only" memory capability offered as an accessory on several communications receivers. We all thought that a plateau was reached when JRC introduced the NRD-515 with an accessory offering a whopping 96 memory channels! That record was shattered by JRC itself with the introduction of the NRD-525 ($1300 in the US) sporting a full microprocessor and 200 memory channels. For the first time, those memory channels "remembered" not only frequency but also filter choice, AGC settings and reception mode. Since, thanks to a sophisticated on-board microprocessor, the receiver is completely tuneable from each memory channel, the 525 offered 200 parallel VFO's along with scanning capabilities. The NRD-525 and the more recently introduced Kenwood R-5000 took automation one step further by offering computer accessory interface boards. These allow PC computer owners to achieve almost fully automated control of the receiver.

As the 1990s approached, ICOM introduced the R-9000, surely the ultimate "hobby" receiver at close to US$5000! The R-9000's highly sophisticated automation scheme will be left to George Zeller's review in this edition of *Proceedings*.

This brief history of receiver automation is offered to make several points. First, the drive toward automation has been very rapid. Secondly, we now have radio receivers that also contain moderately capable microprocessor/computers. Thirdly, since most of us now own a home computer, the development of a radio with a built-in computer to operate it is forcing us to buy one computer more than many of us really want. If we pay $400 for an interface board and software to control our R-5000 or NRD-525 with our own PC, then the computer in the radio (for which we paid several hundred dollars) is truly redundant!

DEVELOPMENT OF THE McKAY-DYMEK DR-333

I was stunned when I first heard the "Black Box" concept applied to a consumer receiver by Wes Olson of Inline Components, Inc., a small California-based electronics firm. Wes simply asked me why I would want to buy a fairly dumb computer inside a new communications receiver when I already owned a very smart one (my IBM PC clone). That level of creative thinking led ICI to gather a design team from the Southern California military and aerospace communications community to tackle the design of what was to become the McKay-Dymek DR-333. Interestingly, the design team was lead by a superb designer/engineer originally from the famous Plessey team in Great Britain. The third element of the team was the McKay-Dymek Division of the well-known West Coast electronics manufacturer Stoner Communications.

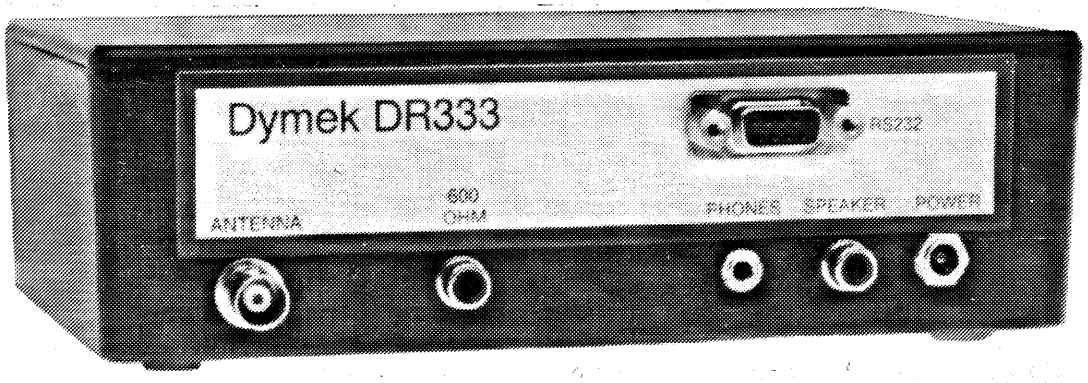


Figure 1. THE McKAY-DYMEK DR-333

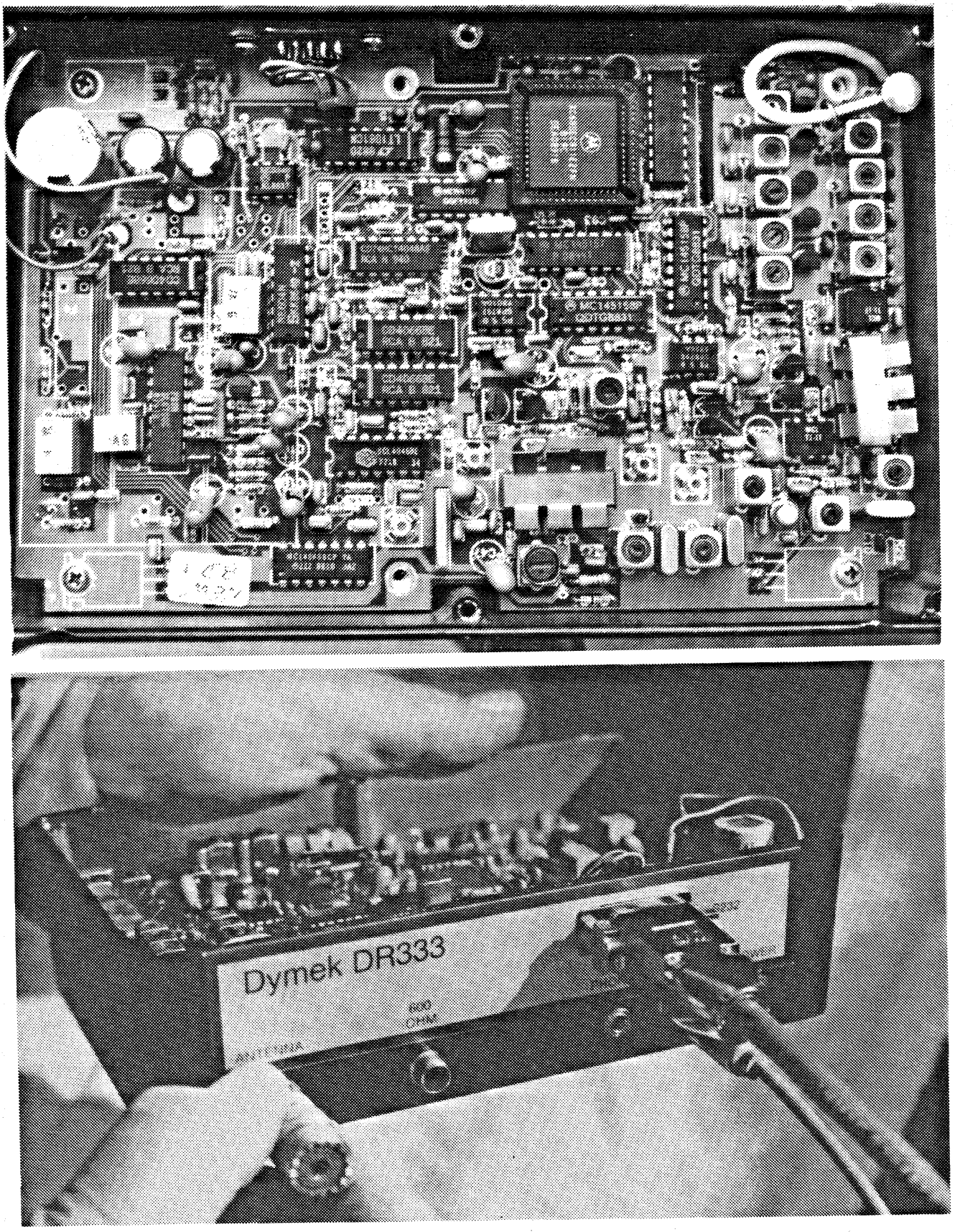


Figure 2. DR-333, a Look under the Hood.

The team's operating concept was that there was a significant market that would welcome the efforts of designers who concentrated on designing RADIO circuits and sophisticated control software and who left it to the user to supply the control hardware (your home computer). This idea is similar to the "Black Box" module approach developed in the design of military avionics some years ago. Since the Black Box concept separates the control and read-out package from the device itself (the Black Box), there are several advantages. As you upgrade your computer for other reasons, you are upgrading your radio as well; as more sophisticated operating environments become available (multi-tasking with Windows 3?) the capabilities of the radio are enhanced. Also, since a Black Box comes with no problem-prone buttons, knobs, switches, pots or lights, there is less likelihood of the radio having mechanical or electrical breakdowns.

As you can see, the DR-333 is truly a black box (matte black, in fact). It measures 7.375" w x 4.75" d x 2.25" h and weighs 2 lbs. The only connections to the receiver are an RS-232 connection to your PC clone computer, the 11 to 16 volt DC power connection, a female BNC Antenna input port, a 4 to 8 ohm audio output RCA jack for a speaker, a mini-jack for low impedance earphones and a 600 ohm audio output for recording, etc. That is it...power, control, antenna input, and three audio outputs.

Before going further, I should note that Wes Olson asked me if I would like to be involved in the latter stages of development of one of the two control software packages that come with the DR-333. I jumped at the chance and essentially acted as one of several "normal user" Beta testers. Over the past 18 months, I have used three different generations of the pre-production DR-333 with developing generations of the two separate software control packages. My regrettably brief use of a near-production version of the DR-333 coincided with the last days of the Final Drafting phase of *Proceedings 1991*.

The receiver's specifications are very impressive and in Figure 3, are compared with those of the new NRD 535 and the R-9000. You should be aware that these are specifications as published by the manufacturers and may not always have been measured in the same ways. I must say though, that I know of some bench tests which show that the DR-333 is even more sensitive that its 1 microvolt spec for AM reception.

The professional monitoring and surveillance applications of this receiver seem obvious and its success in those venues seems assured. In the world of hobby radio, the DR-333 is a complete conceptual departure from any previous receiver. Beyond being an electronic novelty, the DR-333's success in the hobby world will hinge on three crucial questions:

1) How TRADITION-BOUND are radio hobbyists? Will they accept any radio, no matter how good, that has NO knobs to twist or buttons to punch?

2) How good a RADIO is it, anyway? Putting a 286 or better computer and some memory behind anything can make a good scanner, but how good a general-use listening and DXing radio is it?

3) How good is the SOFTWARE? Is it easy to learn and to remember how to operate? Will it do things for us that a "normal" radio won't do...things that will help us hear more DX? Most of all, is the damn thing fun to play with???

THE SOFTWARE: OVERVIEW

The two software operating programs that come with the DR-333 are so different from each other that, from a user's point of view, you really get two different radios when you purchase the DR-333. The software that most radio people will first find attractive and reassuring is the graphically-oriented Special Purpose Program (SPP). You operate the 333 with this software from a main computer screen that looks like a radio (See Fig. 4). This program may be run using the arrow keys, but using a mouse is much easier. The Special Purpose Program software, being more graphic, requires a CGA or better color monitor. I use the DR-333 with the SPP software on a laptop with a "CGA compatible" monochrome screen, and it looks great!

Please note though, that the software that I find by far the most effective is the OTHER one: the Standard Operating Program (SOP). The SOP is a menu-driven alpha-numeric text-based program which really allows you to get the most out of the receiver. However, the SOP software gives you no reassuring drawings of knobs, buttons, etc. on the screen.

The Standard Operation Program software was carefully designed to require the most modest of PC clone hardware: 256k RAM and DOS 2.0 or higher. My XT clone laptop computer operates the SOP driven DR-333 very satisfactorily. This combination offers the possibilities of very portable operation since both units operate from 12 or 13 VDC power. The SOP software does look better with a color monitor and does operate more quickly with a 286 or 386 machine. However, careful design of the SOP software has given even the owner of very modest (and now, very affordable) computers an amazing array of DX tools.

Since these two programs operate so differently and offer the user such different capabilities, it makes the most sense to continue this discussion on twin tracks. Since the graphically-oriented SPP software is the package people will tend to use first with the receiver, we will deal with it first.

SPECIFICATIONS	R-9000	NRD-535	DR-333
FREQUENCY COVERAGE	.15 kHz to 1999.8 MHz	90 kHz to 30,000 kHz	10 kHz to 29.999995 MHz
TUNING RESOLUTION: **ACTUAL**	10 Hz	1 Hz	1 Hz
TUNING RESOLUTION: **DISPLAYED**	10 Hz	10 Hz	1 Hz
PASS BAND TUNING	IF Shift	+ or - 1 kHz	+ or - 1 kHz
NOTCH FILTER	YES	YES	NO
MODES	AM, SSB, CW, FSK, FMN, FMW, TV	AM, SSB, CW, RTTY,FAX,NFM	AM, SSB, CW, RTTY, FAX, FSK
IF FILTERS	12, 8, 2.6	12,6, 2.0, 1.0, + variable + options	2.7 and 6.0 + many options
SENSITIVITY	AM 1.μV (HF) SSB .16μV CW .16μV FSK .16μV	AM ? SSB .5μV CW .5μV FSK?	AM 1.μVolt SSB .5μVolt CW .25μVolt FSK 2.μVolt
IMAGE REJECTION	>90 dB	>70 dB	>90 dB
1st IF REJECTION	>100 dB	>70 dB	>70 dB
2nd IF REJECTION	?	?	>100
3rd ORDER INTERCEPT	33 dBm	?	30 dBm
MEMORY CHANNELS	1000 w/comment	200	9,999 w/comment
BAND SCAN MEMORY	?	1	999 w/comment
SPECTRUM OCCUPANCY DISPLAY	YES	NO	YES
EVENT TIMERS	6 EVENTS	1 EVENT	NONE, BUT PROGRAMMABLE
TONE CONTROL	BASS and TREBLE	"TONE"	NONE
CONTROL REQUIREMENTS	DIN port only. PC control not easy.	May connect a PC. No software provided. RS-232	Must have IBM PC compatible, 256K, Mono or Color
DIMENSIONS	16.7"x5.9"x14.4"	13" x 5.5" x 11.25"	7.4" x 2.25" x 4.75"
WEIGHT	44.1 lbs.	20 lbs.	2 lbs.
POWER REQUIREMENTS	Power supply internal AC ONLY	Power supply internal. All normal AC voltages plus 12 V DC	Must have 11-16 V DC supplied externally. (normal ops. 320 ma)
APROX. RETAIL	$4700.00	$1600.00	$1500.00

Figure 3. PARTIAL SPECIFICATIONS As published by the manufacturers

THE SOFTWARE: SPECIAL PURPOSE PROGRAM

The Special Purpose Program (SPP) is graphically oriented and optionally, uses a mouse as the major control device. Figure 3 is a print of the main screen. The SPP driven DR-333 offers a radio that, like the R-9000, includes a "spectrum analyzer."

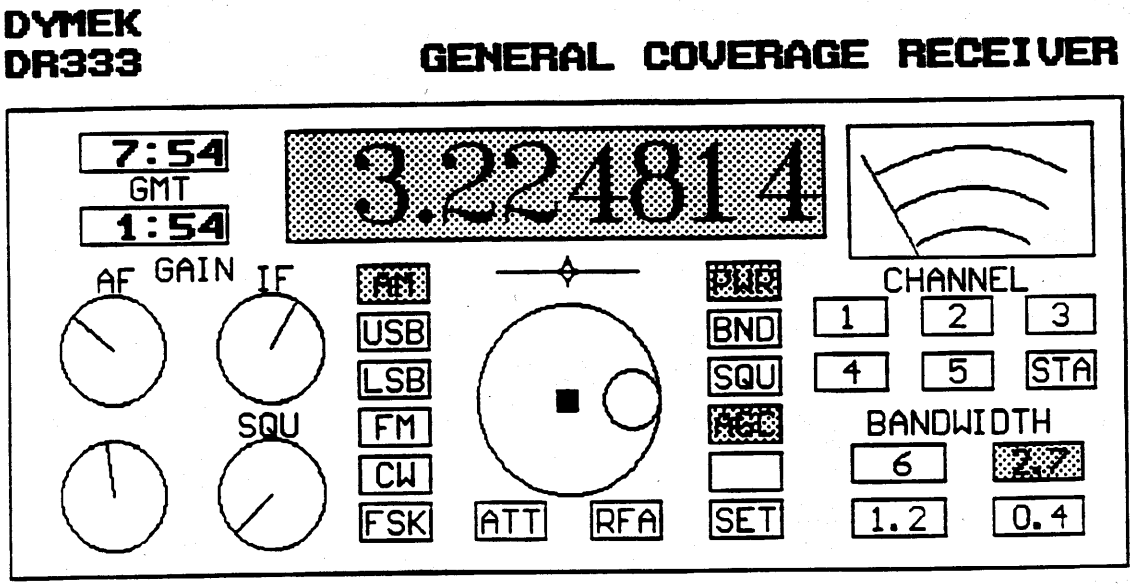


Figure 4. Computer Monitor Representation of The DR-333 as Driven By the Special Purpose Program. The cursor is in the middle of the tuning knob.

If you are at all familiar with mouse use, operating the DR-333 with the SPP software is similar to operating a conventional 525 or R-5000. From the main control panel, you just point and shoot to change the volume, the IF level, etc.

With the Special Purpose Program, the DR-333 offers Pass Band Tuning in 10 Hz steps, plus or minus 600 Hz. (The Passband Control is the horizontal line and diamond below the frequency indications). It also offers dual on-screen clocks and 100 memory channels. There are other operator conveniences not quite as apparent from the front panel. First, there is absolute tuning in one (1) Hz increments. That is, you can specify 3.224814 megahertz and the receiver responds! To my knowledge, this is the first "commercial grade" receiver to allow such fine control and readout of frequency. Actual tuning can be accomplished in several ways. Continuing the tradition of McKay-Dymek, you may "click" on the tuning knob and then once the cursor is on the proper numeric position in the readout, scroll that numeric position up or down.

EXAMPLE:
You want to listen to 5975.000 in the evening for BBC and you left the DR-333 parked on Australia's **9580.000**. To get to the BBC, you put the cursor on the megahertz position and scroll from 9 down to 5 (radio dial then reads **5580**); move the cursor to the hundreds of kilohertz position, scroll the 5 up to 9 (it then reads **5980**); move the cursor to the 8 and scroll down to 7 (it then reads **5970**); then move the cursor to the 0 and scroll to 5. The receiver now reads **5975.000** and you are listening to the BBC. This particular operation is much less cumbersome than it sounds, but still leaves something to be desired.

This tuning concept does continue the tuning tradition of the famous DR-22 and DR-33 of a decade or more ago. Those receivers were tuned by a set of rotary switches, with digital indicators above each switch. To tune 5975 kHz, you rotated the "ten's of megahertz" switch to '0', the megahertz switch to '5', the hundreds of kilohertz switch to '9', the tens of kilohertz to '7' and the kilohertz switch to '5'. The front of the receiver then read 05975.

A second means of tuning using the SPP software is to access the 100 memory channels that each remember frequency, mode and filter setting. The third means of tuning with this software is to click on the

BND button on the front panel. This kicks up a menu set in a window in the upper left-hand corner of the screen giving you instant access to various MW, SWBC, amateur and user-defined bands. You highlight the desired band and hit **'ENTER'**. In all, there are 5 other menu windows which allow you to change the default settings of the receiver and do other housekeeping chores.

The 100 memory channels offered with the Special Purpose software does make SWLing much easier. You just use the channels like push-buttons on your car radio. However, after a decent amount of experience with this software, I find that I only use the SPP software when I what to use the "Spectrum Analysis" package. For any other purpose, the Standard Operating Software is far superior.

SPECTRUM ANALYZER

The Special Purpose Program (SPP) software also offers a Spectrum Analyzer, as shown in Figure 5. Initially, I had expected an oscilloscope-like animated display of the characteristics of the 20 kHz or so of spectrum that I was monitoring...I have always wanted to "see" the QRM "live." However, I believe that the term for that kind of gear is a "panoramic display." The DR-333's Spectrum Analyzer is identical in type to most professional monitor spectrum analyzers that are also known as spectrum occupancy monitors or analyzers. This function is similar to that offered on the R-9000. In operation, the Spectrum Analyzer rapidly divides the user-defined spectrum to be analyzed into 400 "stops." It then makes a single minute-long sweep, measuring and displaying the signal level present at each of the 400 stops. A moveable "marker" finds the specific frequency of each stop and an overlay grid may be imposed when needed. The narrowest band of frequencies that the Analyzer will display is 50 kHz and the maximum is the full limit range of the receiver.

I was concerned that static bursts in the spring and summer would render this tool useless. That has not been the case, mostly due to the "Average" function. When that function is invoked before a sweep, the display is 'calmed' considerably and signals do stand out from noise quite nicely in most cases.

When used close in, looking at 50 to 100 kHz at a time (refer to Fig. 6), the display often paints with enough detail to see the side bands of each signal as separate elements. This works best if the narrower IF filters are invoked before the sweep.

After an analysis sweep has been completed, it is possible to go back and investigate various signals while the chart is still on the screen. It is possible to use the "Find" function to move the graphic marker and the tuned frequency of the radio left and right across the screen in steps. You hear each signal as you go. It is also possible to investigate specific frequencies within the analyzed spectrum by invoking the "Mark" function and typing in the frequency of interest.

It is wonderful to see what I have been hearing all these years! However, I am not sure of the practical application of this professional function to our hobby use. I have been pleasantly surprised however, at the clarity with which I can see all but the weakest inaudible signals under all but the noisiest band conditions.

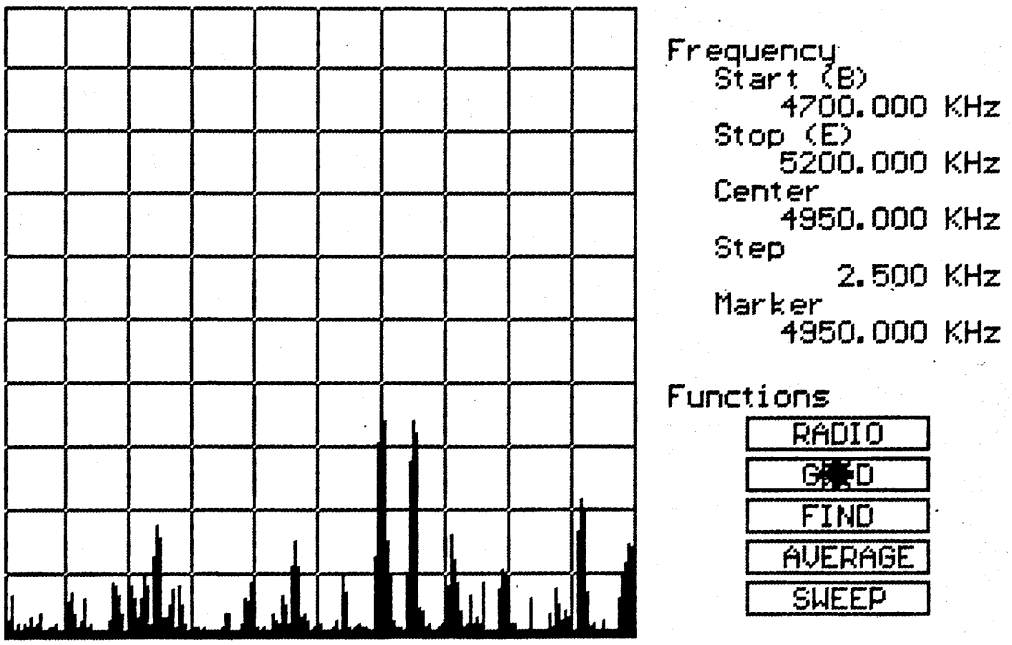
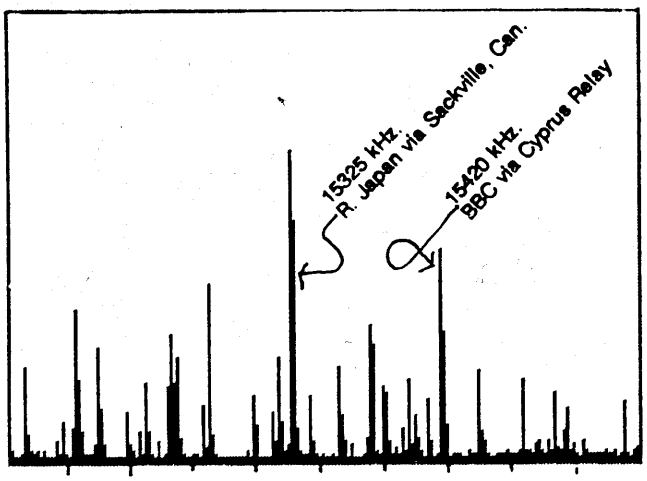


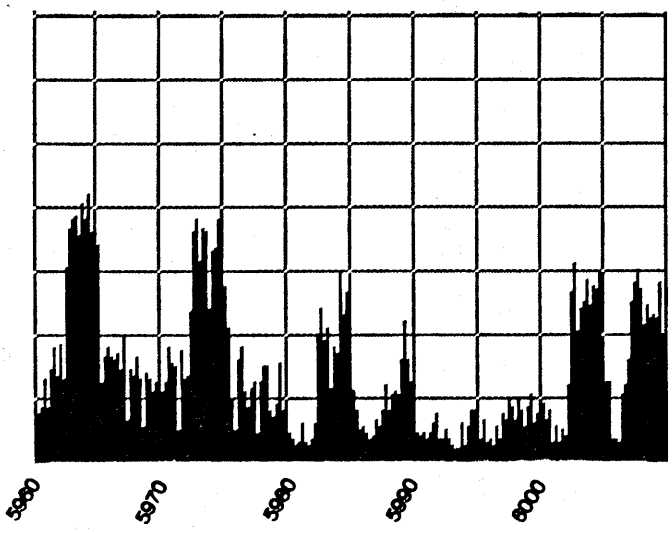
Figure 5. DR-333 (SPP Software) Configured as a Spectrum Analyzer
As you may note from the information on the right of the screen, the spectrum width was from 4700 kHz. to 5200 kHz. The horizontal divisions each represent 30 kHz. The time was 0330 (mid-evening.) The two strongest signals are to the right center are WWV on 5000 kHz. and Cuba's Rebelde on 5025 kHz.



FREQUENCY: 15100 kHz. to 15600 kHz.
TIME: 0402 UTC
STEP: 2.5 kHz.
BANDWIDTH: 6 kHz.

COMMENTS: Since the Analyzer automatically segments the operator determined frequency band into 400 divisions, the scan "step" is determined internally. When the frequency width is this wide (500 kHz.) or wider, I obtain much better results with the receiver bandwidth set at 6 kHz. The Analyzer will then "see" stronger signals as more than one vertical bar.

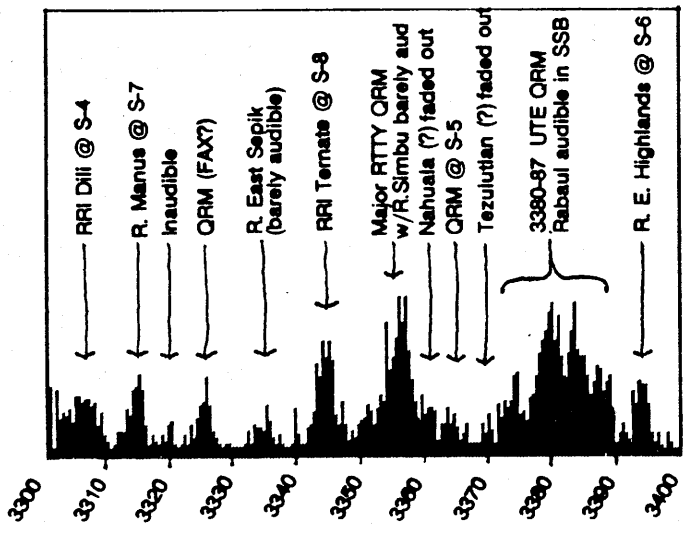
The tick marks, added by the author, at the bottom bar each represent 50 kHz. The station identifications were added manually.



FREQUENCY: 5960 kHz. to 6010 kHz.
TIME: 0320 UTC
STEP: .200 kHz.
BANDWIDTH: 2.7 kHz.

COMMENTS: With an analysis of only 50 kHz., the narrow bandwidth of 2.7 obtains the most useful results. The horizontal divisions of the grid each represent 5 kHz. Note that all signals appear to be shifted about 1.3 kHz to the left. This is a glitch in the pre-production software, both SPP and SOP, which is only present when the 2.7 kHz. filter is invoked.

The signal to the far left is Havana on 5965 kHz. The next major signal, on 5975 kHz. is the evening service of BBC via Sackville.



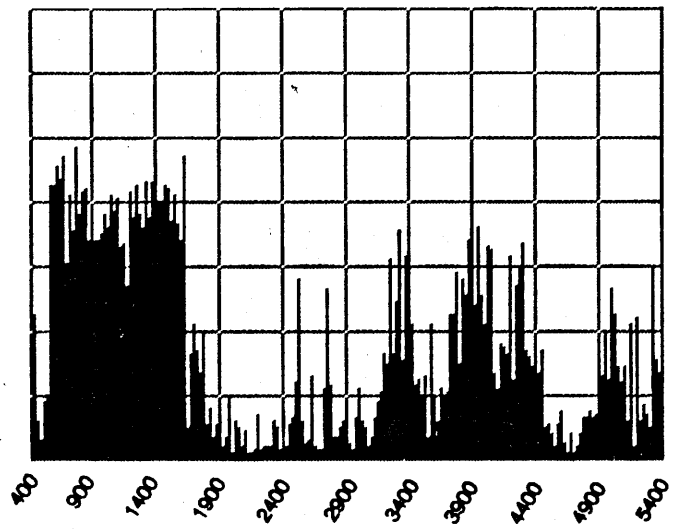
FREQUENCY: 3300 kHz. to 3400 kHz.
TIME: 1200 UTC (max dawn enhancement)
STEP: .500 kHz.
BANDWIDTH: 2.7 kHz.

COMMENTS: This is a run at exactly maximum dawn enhancement on a typical early September morning. There is a good deal of thunderstorm static present. Propagation conditions are markedly sub-par.

This analysis does give a good indication of every signal climbing above the band noise floor. However, it is possible for a good DXer to at least partially copy voice signals which are at or slightly below the band noise, thanks to our personal built-in "speech recognition" talents. That kind of signal will be missed by the Analyzer, of course.

Figure 6. Three Analysis runs, illustrating very typical results from Shortwave

This Figure illustrates three partial Analyzer screens, truncated for convenience, as displayed during Spectrum Analyzer use. These are dot matrix prints of a CGA resolution screen. The square Analyzer frame is about 4.5 inches square on a 14 inch color monitor. The images are considerably enhances in color, with the optional grid and Mark indicator being a different color from the signal strength bars. With the exception of the lower illustration in this Figure, All analysis runs shown in Fig. 5 and Fig. 6 & 6A were done on a single evening between 0300 - 0400 UTC (mid-evening) with active thunderstorm cells about 50 miles away. See notes beneath Fig. 6A for techniques used in obtaining hard copies of these analysis screens.

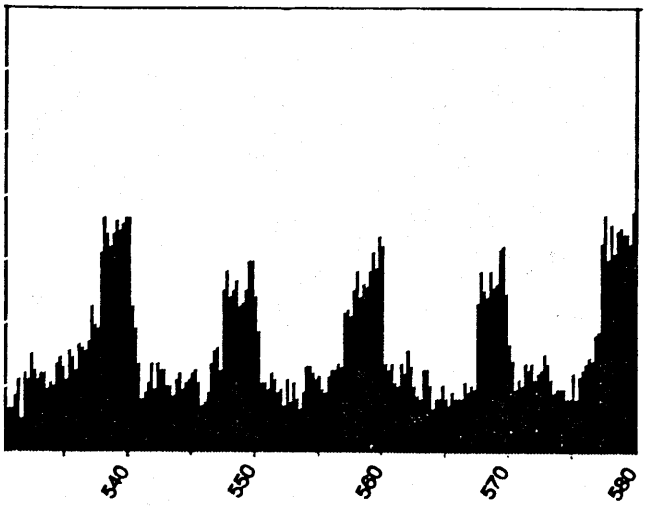


FREQUENCY: 400 kHz. to 5400 kHz.
TIME: 1100 UTC
STEP: 10.0 kHz.
BANDWIDTH: 6.0 kHz.

COMMENTS: This scan is a more or less panoramic analysis of the Medium Wave and Tropical Band spectra. The horizontal grid divisions each represent 500 kHz.

The Medium Wave Band is easily noticeable. Little activity is present on 120 Meters (around 2400 kHz.) The 90 Meter broadcast band, just to the left of 3400 kHz, is quite active, as is the 80 Meter Amateur band centered around 3900 kHz. The lower portion of 60 Meters is strangely quiet (to the left of 4900 kHz., while WWV, 5000 and Rebelde, 5025 are quite obvious.

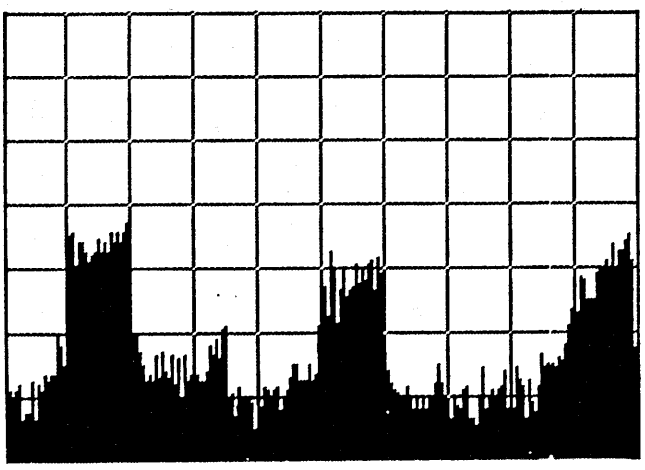
Frequency notations added by author.



FREQUENCY: 530 kHz. to 580 kHz.
TIME: 0330 UTC
STEP: 0.2 kHz.
BANDWIDTH: 2.7 kHz.

COMMENTS: This scan covers 50 kHz. and horizontal division is 5 kHz. With the previously mentioned pre-production software glitch, all signals are shifted about 1.3 kHz. to the left of the proper grid point. The MW channels are clearly visible. The space between them is slightly exaggerated by the "averaging" function. However, the real space between these channels is almost this wide, thanks to the superb IF filtering.

The analysis scans tends to emphasize the upper sideband, graphically, most of the time. I am unsure why this is the case, but I have not found it objectionable.



FREQUENCY: 535 kHz. to 560 kHz.
TIME: 0335 UTC
STEP: 0.1 kHz.
BANDWIDTH: 2.7 kHz.

COMMENTS: This scan covers 25 kHz. and is about as "close in" as the current software will go. The horizontal divisions represent 2.5 kHz. Again, the mistaken 1.3 kHz signal offset (to the left) is apparent. The left hand signal is XEWA on 540 kHz. at about S-7. The signal on 560 is actually a mixture of an American and a Latin station. There was a significant sub-audible hetrodyne on the channel, indicating that one of that stations was off frequency. This may be the cause of the smeared look of the right hand signal. The small blip at 545 kHz was present thru several sweeps. This was not detectable as a het in SSB mode with the DR-333 or my 525.

Figure 6A. Typical Spectrum Analyzer results at Medium Wave frequencies.

This and other partial Spectrum Analyzer displays were printed from a CGA screen using the graphics screen print utility GRAFPLUS produced by Jewel Technologies of Seattle, WA. The images were taken from a CGA screen and printed out on a 9 pin dot matrix printer. They were then reduced 50% in size by photocopy methods. The images in Figure 6. are truncated to fit three per sheet and represent the only the lower 80% of the normally square graphic display.

THE SOFTWARE: THE STANDARD OPERATING PROGRAM

At first glance the numeric/text version of the software, known as The Standard Operating Program (SOP) is somewhat alien to "a real radio man." There isn't even an animated drawing of a friendly knob, dial or switch on the screen! The two main screens should be familiar to almost any casual user of general computer software: menu-driven. After using this SOP version software for some time, I am convinced that it, or user-modified versions of it, will be the software of choice for most serious DXers and SWLs. This version of the control software allows you to combine and maximize the power of your computer and combine it with excellent state-of-the-art radio gear.

With the SOP software, the DR-333 offers 9,999(!!!) memory channels filed at the operator's discretion in any of several formats. Each channel records all main receiver settings and, thankfully, includes a 15 character comment line. The channels may be quite easily accessed manually (my preferred method) or you may automatically scan as many adjacent channels as desired. The receiver also provides up to 999 separate user-defined band scans.

It is the SOP version software, of course, which allows remote as well as highly automated operation of the DR-333. The remote operation may be via hardwire, modem or RF link.

HANDS ON OPERATION

With all of its power, I am still amazed that the SOP software is so easy to use. I feel obligated to take you through just a bit of the operation. From either main screen, Fig. 7 or Fig. 8, you may control the receiver manually. To control frequency, you may simply type **'f'** followed by the number, followed by **'k'** for kilohertz or **'m'** for megahertz, and you are instantly on that frequency. Also, you may type in the full frequency in hertz followed by **'enter.'** I have always thought in kilohertz, so to tune in BBC in the evening, I type **'f5975k'** and when I hit the **'k'**, I'm there. Similarly to tuning the DR-333 with the first (SPP) software, you may tune the receiver using the Standard Operating Software just like the famous DR-33. In this case, each Function key controls one decimal place of frequency in hertz. That is, you punch the **F1** key to control the 10's of megahertz, with each tap of the key adding or subtracting (**Shift + F1**) 10 megahertz from the tuned frequency. The **F2** key controls the single megahertz; the next Function key controls the hundreds of kilohertz, etc. In addition to direct entry tuning, the other controls may be adjusted manually from any screen. The prompts necessary to adjust the other controls manually are located in the upper right of the screen and along the bottom bar.

The use of "hot keys" to adjust audio, IF, mode, band width and the other controls is easy and intuitive. The on-screen prompts virtually eliminate the need to refer to any notes or manual.

Manual operation of the DR-333 is much easier and faster with the Standard Operating Software than with the SPP software discussed earlier. I will admit however, that I shall always miss having a few knobs to focus on when straining to catch some audio from weak Indonesian stations at 4 AM.

```
MEMORY AVAIL:  42494                                          DYMEK DR333
                          2309.600 kHz USB   CHAN1000      SIG  0
                               0     PBT                    =
    UTC     01:00:25                                       -= VOL        30
    DAY     04-03-91                                       [] IF        ???
    LOC     07:00:25                VLBA ALICE SPR         m  MUTE       ON
                                                           a  AGC       SLOW
    RADIO   ON                                             b  BW         6.0

CHANNEL MENU                                                        57 CHANNELS
   R-Read          O-Output          N-New       E-Edit    D-Delete
-Scroll-up    -Scroll-down    P-Pick      T-Scan    Z-Exit
    CHAN   FREQUENCY AUDIO  MODE    BW   IF   COMMENT
  ->1000    2309600    22   USB    6.0  30   VLBA ALICE SPR
    1001    2324600    26   USB    6.0  25   VLBT TENNANT C
    1002    2349600    30   USB    6.0  25   RRI YOG+KOREAN
    1003    2359700    18   USB    6.0  20   MAYA DE BARILL
    1004    2376400    30   USB    6.0  30   RRI SURABAYA??
    1005    2389600    30   USB    6.0  30   RRI CIREB+HUAY
    1006    2409600    28   USB    6.0  30   R. ENGA PNG
    1007    2454600    30   USB    6.0  30   KARISMATIKA JK
    1008    2472800    30   USB    6.0  30   RRI PURWOKERTO
    1009    2484600    20   USB    6.0  25   VLBK KAT NOQSL

h-LSB  j-AM  k-USB  l-CW  c-CHANNELS  f-FREQ  u-UTC  s-SCANS  w-WWV
```

Figure 7. SOP Channel Screen

MEMORY CHANNEL OPERATION

The memory channel section of the SOP software offers an incredibly powerful and useful tool to DXers and SWLs. Note the channel screen above. The current time and date information is in the upper left. Current tuning information (the "dial") is in the upper center and the other control settings are in the upper right. The individual hot key prompts are to the left of each control, its current setting to the right. For instance, the **"b BW 2.6"** line tells you that tapping the **'b'** key will cycle the DR-333 through various IF bandwidths and that the current BW is 2.6 kilohertz.

The center of the screen contains a bar of prompt information particular to Channel Operation. Below that, any 10 of the current memory channels are displayed. A scroll feature allows a good look at the entire channel file.

Many may wonder if 9,999 memory channels is not over-kill. My experience with the 200 memory channels of the 525 indicates that 10,000 channels is about what I can use effectively. In my brief use of the latest version of this receiver, I have not completely set up the memory banks. However, these are my plans: I have already dedicated the first 100 to "active memory" channels to use while I'm DXing--to check parallels, temporarily save signals found during a rapid manual band scan, etc. The second 100 channels will soon be used to automate listening to various frequencies of the top 20 or so of my favorite program listening stations.

A 24 hour "hit list" of 10 channel per hour of DX tips already occupies another 240 adjacent channels--this is really a semi or fully automated hit list! Long term, about 1000 channels will be taken up with banks of 100 or 200 channels allocated on a regional basis (100 channels of Brazilian targets, 200 Indonesians, etc.) All of this automation is a practical reality for the DXer for two reasons. First, each channel, as you see, displays a 15 character memo note located under "the main dial" when that channel is invoked. Since it is impossible to remember the content of 10,000 channels, the memo feature is an essential element of the DR-333. The second feature that makes all of this possible for us is the remarkable ease of data entry and editing with the SOP software. The designers were quite ingenious in this area, using format boxes, prompts, etc. so that even the least adept typist (me!) finds putting in 100 channels easier than in-putting 10 channels to the 525!

There are two methods of using the channels, once they are in the memory. The first, and my favorite for DXing, is manual-mode exploration. I scroll through the channels "picking" the ones of interest and listening briefly. If I've got a hot one, I can instantly store all the radio settings in a channel in my "active memory" (those first 100 channels). Once I've finished my fast manual run through the channels, I drop down to the "active memory" channels and DX to my heart's content.

Automated scanning of any group of adjacent channels is built in to the software, of course. You can control the amount of time spent monitoring any one channel and you can set a minimum signal level. In channel scanning mode, the receiver stops at every channel that has an above minimum level signal for the specified time period and then moves on the next occupied channel. Unlike UHF scanning, it does <u>not</u> stay on an occupied channel until it becomes unoccupied. The operator is able to stop the scan instantly, however.

I have used the channel scanning in a semi-automated fashion by setting the 'dwell' time at about 2 seconds. In the San Juan Islands, I often monitor 6 or 8 HF Coast Guard frequencies this way. If there is interesting chatter on a channel, I stop the scan and then restart it when the chatter ends. I also have set up my favorite Indo frequencies so that I can scan them with about 1 second stops. I have the frequency offset and the receiver in side band. I just listen for the whistles and note down which channels look interesting. I can check 100 Indo frequencies in less than 2 minutes and then return to spend time with the best. Try that strategy with a R-390A sometime!

It is also possible to create an automated "log" that only notes those channels with signals above the user-set minimum level and records the signal strength present. (Similar to Fig. 9). This totally automated function is probably a very useful capability in professional monitoring and surveillance, but I have not found it useful in my own DXing.

BAND SCANNING OPERATION

Figure 8 is the second main screen of the SOP software configured DR-333. As you will note, the upper half of the screen and the lower prompt bar of the Band Scan Screen are identical to the Channel Screen (Fig. 7) previously discussed. The lower half of the screen displays 10 of the up to 999 user-defined band scans. Essentially, it is possible to declare segments of the spectrum "Bands" and then scan them. Since the bands are scanned individually, the declared bands may overlap, need not be sequential, etc. Besides setting the start and end frequency, the operator determines the "Scan Step" that's the increment of tuning (from 1 Hz) and "Scan Delay" that's the time spent at each frequency that has a signal stronger than a user-determined minimum strength. The operator also determines Audio, and IF Gain, Mode and Band Width. The settings are constant for that particular band scan.

As with Memory Channel Operation, it is VERY easy to edit existing Band Scans and create new ones. Also, as with the Channel scanning operation, one can stop and then restart the scan at any moment. Again,

as with the Channel Operation, the operator may create a text file "log" of the Band Scan that records the frequency and signal strength of each active step in the Band Scan. An example of a log of a band scan is shown as Figure 9.

Frankly, this capability has been of less interest to me than the other segments of the two software programs. I think that I will much prefer to use "screen grabbing" software to grab a graphic representation of a band scan from the Spectrum Analyzer. The graphics output is easier for me to grasp than the alpha-numeric output of these logs. However, this Band scanning capability and its ability to create a text log file would be a powerful DX tool if coupled with a timing device to allow you to Band Scan while you sleep.

```
                                                                    DYMEK DR33
                          9850.000    USB    CHAN          SIG  6
                                                           =

   UTC     02:30:31                                          -= AUDIO     17
   DAY     03-23-91                                          [] IF        30
   LOC     20:30:31                                          m  MUTE     OFF
                                                             a  AGC     FAST
   RADIO   ON                                                b  BW       2.7

 BAND SCAN MENU                                                      12 BANDSCANS
    R-Read          O-Output          N-New       E-Edit       D-Delete
 -Scroll-up     -Scroll-down    P-Pick     T-Restart    Z-Exit
    SCAN START-FREQ    END-FREQ     STEP DELAY  SS AUD MOD   BW IF LO COMMENT
 ->    1     500000     1610000    10000  2000  60  18  AM 6.0 60  Y am
       2   14950000    20100000     1000  2000  20  17  AM 6.0 30  Y sw1
       3   21150000    21500000     1000  2000  60  18 USB 2.7 60  Y 15 meters
       4    7150000     7300000     1000  2000  20  18 LSB 2.7 30  Y 40 meters
       5     500000     1700000     1000  2000  20  17  AM 6.0  1  Y short wave sca
       6   14900000    20100000     1000  2000  30  18  AM 6.0 30  Y SW scan
       7   14150000    14500000     1000  2000  30  18 USB 2.7 60  Y 20 meters
       8   28150000    29222000     1000  5000  50  18 USB 2.7 60  Y 10 meters
       9    3220000     5850000     1000  2000  20  19  AM 6.0 30  Y low end SWL
      10    9000000    10000000     1000  2000  20  18  AM 6.0 30  N 9-10 MHz scan

 h-LSB  j-AM  k-USB  l-CW  c-CHANNELS  f-FREQ  u-UTC  s-SCANS  w-WWV
```

Figure 8. SOP Band Scanning Screen

```
BAND SCAN MODE
START FREQ =    3199000
END   FREQ =    3300000
FREQ STEP  =       1000
TIME DELAY =       2000
MIN SS     =         55
LOG WANTED =        YES
stp 3199000 SS=152      stp 3223000 SS=254   stp 3248000 SS=254   stp 3271000 SS=120
stp 3200000 SS=102      stp 3224000 SS=152   stp 3249000 SS=152   stp 3272000 SS=230
stp 3202000 SS=230      stp 3227000 SS=230   stp 3250000 SS=102   stp 3273000 SS=96
stp 3203000 SS=254      stp 3228000 SS=96    stp 3251000 SS=120   stp 3274000 SS=152
stp 3204000 SS=152      stp 3229000 SS=224   stp 3252000 SS=230   stp 3275000 SS=102
stp 3207000 SS=230      stp 3232000 SS=230   stp 3253000 SS=96    stp 3277000 SS=230
stp 3208000 SS=96       stp 3233000 SS=254   stp 3254000 SS=224   stp 3278000 SS=254
stp 3209000 SS=152      stp 3234000 SS=224   stp 3257000 SS=230   stp 3279000 SS=224
stp 3210000 SS=102      stp 3235000 SS=102   stp 3258000 SS=96    stp 3280000 SS=102
stp 3212000 SS=230      stp 3236000 SS=120   stp 3259000 SS=224   stp 3281000 SS=120
stp 3213000 SS=96       stp 3237000 SS=230   stp 3260000 SS=102   stp 3282000 SS=230
stp 3214000 SS=152      stp 3238000 SS=254   stp 3262000 SS=230   stp 3283000 SS=254
stp 3216000 SS=120      stp 3239000 SS=224   stp 3263000 SS=96    stp 3284000 SS=152
stp 3217000 SS=230      stp 3241000 SS=120   stp 3264000 SS=224   stp 3285000 SS=102
stp 3218000 SS=254      stp 3242000 SS=230   stp 3266000 SS=120   stp 3287000 SS=230
stp 3219000 SS=224      stp 3243000 SS=96    stp 3267000 SS=230   stp 3288000 SS=96
stp 3220000 SS=102      stp 3244000 SS=224   stp 3268000 SS=254   stp 3289000 SS=224
stp 3221000 SS=120      stp 3246000 SS=120   stp 3269000 SS=224   stp 3290000 SS=102
stp 3222000 SS=230      stp 3247000 SS=230   stp 3270000 SS=102   stp 3291000 SS=120
```

Figure 9. SOP Band Scan Log

Conceptually, the SOP software combines the best automation ideas from scanner design with a real understanding of how "we" use radios, whether DXing or program listening. Further, this software allows you to operate the radio over a full range of degrees of automation, that is, from "hands on" to stand-alone totally automated monitoring or remote monitoring via modem from half a world away.

OTHER USES: UTILITY DXING

I don't have much experience in the world of HF utility DXing. However, I understand that most UTE's are fixed frequency operations that shift periodically between a fairly limited number of fixed frequencies and I believe that most UTE DXing occurs outside the unstable and static-ridden Tropical Bands. That being the case, Utility DXers should be able to make maximum use of the automation of SOP software. For non-voice modes, the McKay-Dymek people are planning on-boaard demodulation of many other modes.

Frankly, I wish that I'd had this radio during the Gulf War. It would have been super to input 100 or so Military Airlift and SAC frequencies and let this Black Box do its thing. From what little I know about this segment of the hobby, the DR-333 should be a UTE DXer's dream.

OTHER USES: SPECTRUM MANAGEMENT & MONITORING

I also know very little about the professional field of spectrum management and rule enforcement. This is the area of law enforcement and planning undertaken by the FCC and similar telecommunications agencies throughout the world. I have it on very good authority that a number of national telecomm agencies are quite interested in the DR-333. I believe that the only other receivers in the world that offer similar capabilities in automation, remote operation and quality of hardware are the receivers from the German manufacturer Rohde-Swartz. The prices of these receivers begin an around $4000!

With a good event timer added to the software package, this receiver also seems a natural for use by major broadcasters for monitoring their own broadcasts and those of their competitors. The ability to operate the receiver remotely via either RF or telephone links and the ability to operate the same receiver hands-on, like any other receiver seems to offer a great deal to major broadcasters, as well as those less automated and less well funded. Military and law enforcement uses for this gear seem a natural, as well.

HOW GOOD A RADIO IS IT?

If your tastes and radio operating pattern relate to the McKay-Dymek tuning scheme (if you can give up analog tuning), *you are going to love this radio*. PERIOD. If you think that you can't give up having at least some semblance of analog tuning, or if you absolutely cannot survive without turning at least one knob, *you may miss owning a truly superb radio*.

Unfortunately, production runs of the DR-333 were delayed longer than I expected when I volunteered to do this article. I understand that much of the delay was related to Desert Storm. Most of my experience with the DR-333 is with a receiver from the last pre-production factory run. The following remarks are based on this 'almost' production run.

Audio: There was a persistent background hiss in some of the prototypes. That problem appears to be solved. Even with the hiss, the audio was super--without it, I am hearing things that I've never heard before, even when using the MAP Unit. Syllables are more distinct and intelligibility is improved markedly over any SW receiver that I have ever used. The audio obviously has been fine tuned for the speech spectrum. This may be one of the few (only?) solid state receivers with a chance to have better audio than the best of the tube gear. *Audio Magazine* has a DR-333 undergoing their rigorous tests as this article is being written. That should say a lot! I believe that the last SW receiver that *Audio* reviewed was the DR-33.

Sensitivity; The receiver is at least as sensitive as my 525 on SW and more so on MW. Unlike most solid state SW radios, the DR-333 does not reduce sensitivity in the MW band. This "wide open" approach may make the receiver overload in some locations. I have never experienced that, however, except with one receiver which had a defective component (not M-D's fault). I have been told that some 333's bench test at less than .5 microvolt sensitivity on AM--a fabulous figure. Given that this sensitivity is available throughout the spectrum, I look forward to using the 333 on MW this winter.

Selectivity: Each of the DR-333 receivers that I have used has sported Collins mechanical filters. With the 333, I think that I am experiencing the full potential of the Collins filters for the very first time. I have Collins mechanical IF filters in my 525 and they improved the poor selectivity of the 525 quite a bit. I now know that the 525's selectivity is still being degraded by the leakage and cross-coupling that Larry Magne complained of when he reviewed the 525. The useable selectivity of the Collins filters in the 333 seems VERY much better than that I experience with essentially those same filters in my 525. The designers of the DR-333 must have been very astute in both circuit design and board layout, because the skirts of the filters seem almost vertical! I have limited experience with this receiver and I lack test bench type equipment. However, I must say that the DR-333 exhibits better usable selectivity than any receiver that I have ever operated.

Since I lack test bench equipment, I cannot judge the more sophisticated parameters of receiver evaluation--ultimate rejection, various measures of image rejection, intermodulation, etc. I can only say that DR-333 pre-production-run receivers that I have used had superb audio and exhibited better selectivity than I have previously experienced. They were quite sensitive and seemed to hear everything that was there; I did not notice any signals that weren't supposed to be there. Within the approach to receiver design taken by the Stoner/McKay Dymek team, the DR-333 is a superb receiver.

HARDWARE OPTIONS

The manufacturer has recently announced that they will be offering fully operating packages of a portable computer packaged with the DR-333. Although this is primarily a service to commercial and governmental purchasers, it may be of interest to some in the hobby. Initially, one of the better known laptop computers will be offered as a fully operating computer and DR-333 controller. The McKay-Dymek Division is also planning to offer the current rage of the "palm-top" computer market, the HP-95LX as an option with the DR-333. The 95LX is a hand calculator-sized powerful computer which uses a memory card rather than disks. When the DR-333 and the HP-95LX are purchased together, the 95LX's memory card would already contain the 333's software. This latter package should retail for just over $2000. Not bad for an excellent palm-top computer and a world class receiver.

FOR THE FUTURE

I miss analog tuning! Although the time that I spend SWLing far exceeds my time DXing, what I *really* care about is DXing during those precious minutes every day during dawn enhancement. After a quick semi-automated sweep of my favorite Indo frequencies (which the DR-333 does magnificently) I like to wander around 120, 90 and 75 meters looking almost randomly for pleasant surprises. Totally digital tuning does not allow me to do this as well as I want to.

I understand from the Stoner/McKay-Dymek people that it may be possible to use Track Ball or Mouse movement to emulate a normal old-fashioned tuning knob. However, this welcome event may await incorporating a fiber optics link between the computer and the receiver. The fiber optics link will likely await a whole new generation of the receiver.

SWLs using the receiver for its fine audio will not miss the tuning knob. The many utility DXers who should really benefit from the DR-333's automation will probably not miss the "Big Knob," either....I will.

OTHER IDEAS AND COMMENTS:

Software

It would be helpful to have timed "event programming" control of the receiver to at least the level of sophistication of a VCR. This capability should be very useful in professional monitoring or spectrum surveillance and in the listening hobbies. I am sure that any astute programmer could, (and probably will) develop routines to accomplish this as well as other software upgrades. To facilitate this kind of third party development, McKay-Dymek is offering a disk of programming files as an option with the receiver ($40 extra). McKay-Dymek has focused on keeping the SOP program slim so that modest machines can operate the DR-333. Possibly they can be persuaded to market two versions of each control program: Basic and Enhanced.

Hardware

From the hobby perspective several improvements could be made in an already awesome package:

First, this innovative receiver would be even more welcome if it came with at least three and preferably five electronically switched antenna input ports. Frankly, I cannot imagine any DXer who does not regularly employ more than one antenna. Professional remote and automated monitoring and surveillance would be particularly enhanced by this capability, as well.

Second, an IF notch filter is a very popular device and is found on most major receivers offered since the mid-1980's. The DR-333's Pass Band Tuning is very useful, but sometimes I would like another QRM-defeating weapon. I will admit, however, that the DR-333's superbly effective Collins IF filters may replace the a notch filter for my needs.

Finally, I find that I miss the Tone control available on some major communications receivers. Granted, I almost never use that control on my "normal" receivers, but it would still be welcome.

FINAL IMPRESSIONS

I've been trying to think of an analogy that could illustrate how it feels to DX with the Standard Operating Program configured DR-333. I am the proud owner of a museum quality Hallicrafters SX-28A produced in 1945, undoubtedly one of the finest receivers to come out of WWII. It is everything that a major tube receiver ought to be and it weighs about 75 pounds. It also had such superb audio that it was sold as a

console model and as an early HiFi! Its front panel is stunningly beautiful and the case was designed by the most famous industrial designer of the WWII era, Raymond Loewy. I love this radio! I love looking at it, listening to it and even casually DXing with it. Being a war plane buff too, when I radio with the SX-28A, I sometimes feel that I'm flying the finest WW II fighter plane--the P-51 Mustang. The P-51 looks, sounds, and flies like an airplane ought to look, sound and fly. If the SX-28A is a P-51 Mustang, the R-390A is an F-86 Sabre jet, and maybe, the NRD-525 is a F-15 Eagle. My fighter plane analogy for the SOP-configured DR-333 is the X-wing fighter from the movie Star Wars! DXing with this piece of the 21st Century is an absolutely fantastic feeling. Using it on a semi-automated basis combines the best of my brain, my experience and my ear as a DXer with cutting edge automation and state-of-the-art radio circuitry. It feels and sounds wonderful!

The McKay-Dymek DR-333 will sell for $1495 and should be available as Proceedings 1991 goes to the printer. For further information contact: McKay-Dymek Division, Stoner Communications, 9119 Milliken Ave., Rancho Cucamonga, CA 91730 (714-987-4624)