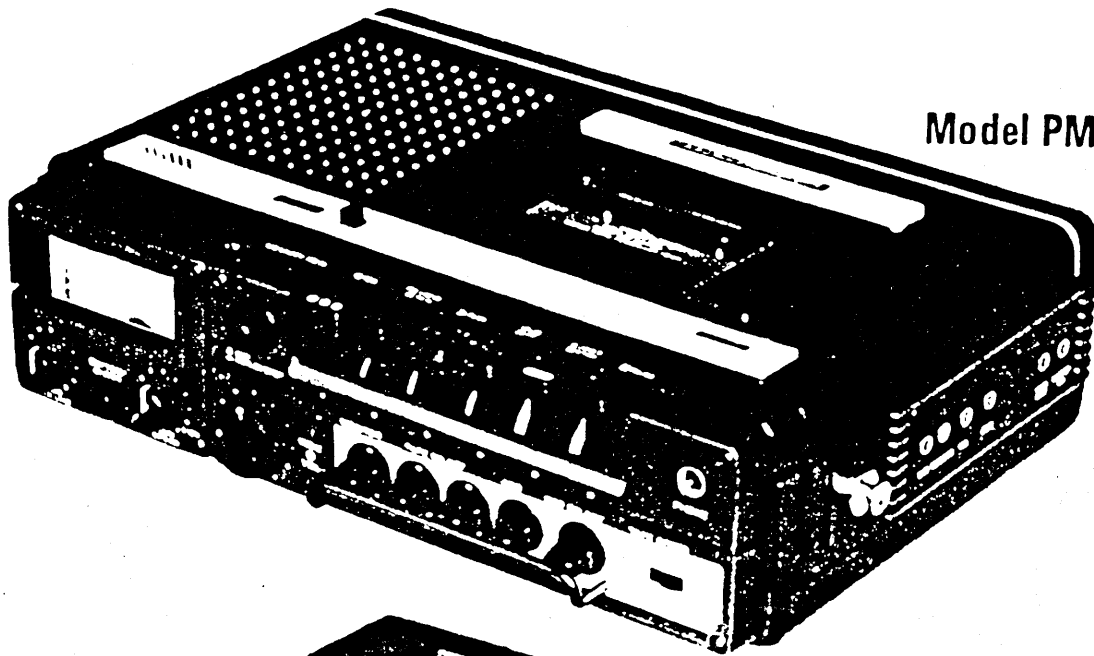


A CLOSE LOOK  
AT  
TWO OF THE BEST PORTABLE CASSETTE RECORDERS

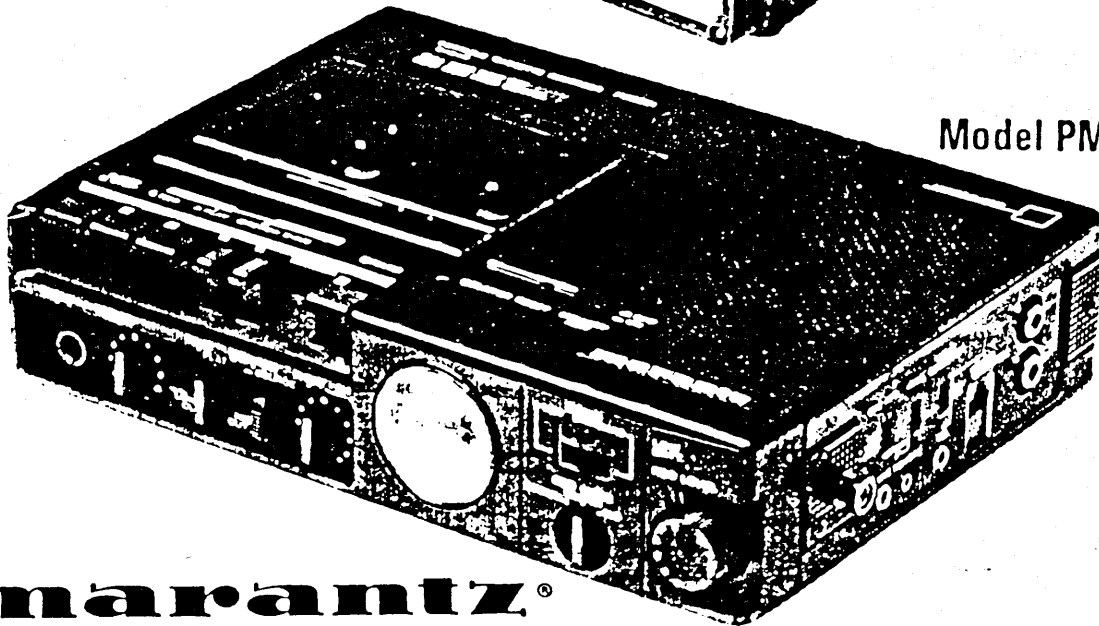
FRITZ MELLBERG

JOHN H. BRYANT

R. CHARLES RIPPEL



Model PMD220

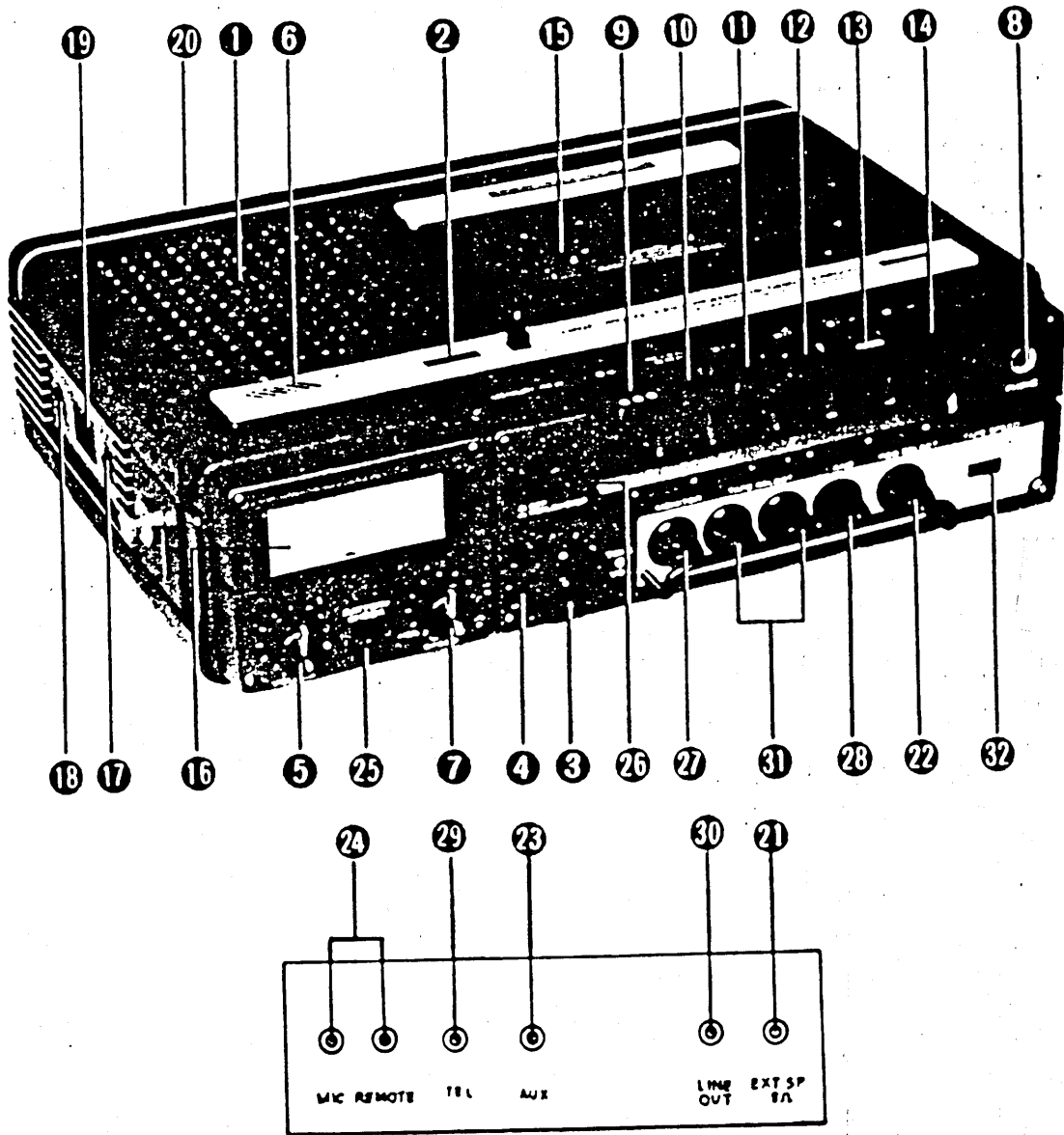


Model PMD221

**marantz®**

The following is a tripartite article. In the first segment veteran MW and SW DXer, Fritz Mellberg reviews the Marantz PMD-220. This recorder, discontinued by Marantz in about 1985, is often available at ham fests and is occasionally available on the used equipment market. In the second segment, John Bryant reviews the 220's replacement, the PMD 221 which he has operated for about two years. In the final segment of the article, Chuck Rippel details the very precise tests to which he subjected his own PMD 221 for publication in Proceedings 1988.

**marantz®**



Model **PMD220**  
PROFESSIONAL  
PORTABLE  
2-SPEED CASSETTE RECORDER

# THE MODEL PMD•220

FRITZ MELLBERG

Why in the world would someone spend \$200 on a tape recorder when \$20 would get the job done? That might be a good question for an accountant, but when it comes to DXing, prudence may not be practical!

If all you want to record is the VOA, the K-Mart special will do the trick. But, if it's Radio Huanta 2000 or some such exotic catch, you want to hear every nuance of sound possible to catch that ID through the fading and static crashes. In this situation, the best possible recorder will become a valuable DX tool.

When I began DXing back in 1980, I decided for reasons of economy to avoid sending off for QSLs. At that time, I was a poor, starving DXer and had to watch my pennies. Spending \$3 or more for registered mail to Bolivia was not my idea of a hobby. So, I bought a used Panasonic portable tape recorder to jack into my used FRG-7 and began to amass hours of audio on cassettes to get those elusive IDs. When I had time, I would edit those long tapes to eliminate all but the precious ID segments of my listening time. I soon realized that I was hooked on audio and was starting a collection of radio IDs from around the world.

My hobby was hearing radio stations; not collecting QSLs. I became obsessed with hearing a far off station and gleaning a discernable ID from the atmospheric trash. It is a glorious high, worth reliving on tape!

Over the years I upgraded my radio several times and even moved up to a decent Radio Shack CRT-50 recorder. But I still had to spend a lot of time editing tapes to eliminate the long stretches of noise that come along with the periodic ID. When I landed a job teaching part time at a local college, I had to look around for something to spend all that cash on. Why not invest in a good tape recorder? Some stereo units might have worked well, but they are not portable, and they require another AM/FM receiver that I was not interested in buying.

After looking around for something out of the ordinary, I ran across the Marantz PMD series. A local radio station used the PMD 220 for its newsgathering, and their program director recommended it as a high quality unit. If it was good enough to provide air-quality tapes, it was good enough for me! When I got a closer look, I discovered it had many features helpful for DXing.

There were four models in the PMD series; a high end and low end model in both mono and stereo versions. I selected the high end mono, the PMD 220. The inexpensive versions come without the monitor tape head and array of filters. After four years of heavy use, I am still happy about paying the \$179!

The PMD 220 has the usual complement of features found on other good portables--one touch record, cue and review, built in mic, rewind, fast forward,

tone controls, total shut off, and so forth, In addition, it has two-speed record, a vu meter, one record/play, and one erase head, plus a third monitor head, an ambient noise control filter system, provisions for using LN, Chrome, or Ferro Chrome tape, plus high bias tape, memory rewind, line out jacks, a jack that allows recording off the phone, and various jacks and switches which make it very versatile. Optional accessories, such as a battery pack, make it an able companion on field trips. It can even be used as a small PA system or allow you to sing along with your favorite recorded Huyanos.

There are several features that are of interest to DXers. First, in addition to the traditional record/play and erase heads, there is a third head that allows one to monitor how well the signal is being recorded. An easy paddle switch allows one to switch back and forth between source and tape. When using this in conjunction with the various filters also available, it's fun to see the improvements you can make in the recording as you go along.

I do most of my listening with headsets, and I often listen through the recorder's audio system and use the filters to clean up noise. The sound is significantly better than with my R71A alone.

You can record in two speeds: the traditional 1 7/8 ips or a slower 15/16 ips. In addition, there is a playback speed control which allows one to vary the speed 20 percent faster or slower. This has been a great help in deciphering some troublesome IDs.

There are three ways one can record a signal, a cheap recorder offers only one. The better model will offer only two. The basic circuit gives automatic level control which boosts low volumes and limits high volume peaks. This does not provide for full dynamic range in recordings, however. A limiter mode cuts out any high volume peaks, but allows you to set the record level manually. A third mode allows full manual control of the recorder level without the limiter. This is the setting I use most often because it gives the best dynamic range.

The handiest feature by far with the PMD is the memory rewind. I could live without all the other gadgets, but I have grown very fond of this feature. When the memory rewind button is operational, pressing the rewind button will run the tape back to the 999 setting on the tape counter and stop.

When I make tapes, I record one catch, run a few seconds of silence, reset the counter to 000, and I'm ready to tape another catch without worrying that I'll erase the previous cut when I have to rewind again. As I am listening, I press record when I sense an ID is coming and I let the tape run. If nothing shows up, I press rewind, and it zips back to 999 and stops. It saves alot of effort!

Another helpful feature is the ambient noise control network. This system cuts off unwanted segments of the audio range at the flip of a switch. "Normal" allows full frequency response, "low cut" reduces boominess, and the third option eliminates both high and low ends. When I am taping a Peruvian in summer months, the third filter helps some; and when I am listening to something like Radio Cairo, with its poor modulation, the low cut filter helps some.

These filters are not the greatest, and they wouldn't be the reason to buy the recorder; but they are there, and they give a little help along the way. A simple equalizer used "in line" would help much more.

The unit weighs 7 lbs. 4 oz. without batteries; a little heavy for a portable! According to the service manual, the harmonic distortion of the recorded tape is less than 4 percent with Normal tape. Signal to Noise ration standards are greater than 43 db with AC supply and 47 db with batteries. These figures don't mean much to me, but they must be decent figures because it provides very clean and sharp audio; and that's what counts!

Power supply options are helpful, too. In addition to house current and four size "D" batteries for portable operation, there is an optional battery pack which reportedly gives great service. You can also operate the recorder from your automobile with the appropriate adaptor.

How does it fare overall? I rate it a B plus, even though my heavy record/rewind use has worn out the mechanical switches inside twice, necessitating a couple of repair bills. The slow recording speed is not as helpful as I thought it might be. At 15/16 ips, the audio quality is disappointing. I suspect that for Ute DXing, it might be satisfactory. The memory rewind feature, together with the high quality tape heads, make it well worth the money for serious tape collectors.

# PMD220

## GENERAL SPECIFICATIONS

Number of Semi-Conductors:		
Integrated Circuits	.....	5
Field Effect Transistors	.....	1
Transistors	.....	7
Diodes	.....	16
Unit Weight (without Batteries)	.....	7 lb. 4 oz. (3.2 kg)
Dimensions (W x H x D)	.....	11-1/2 x 3-1/4 x 7-11/16 in. (29.3 x 8.2 x 19.5 cm)
Power Requirements		
U/C Model	.....	120 V, 60 Hz, 7 Watts
A Model	.....	240 V, 50 Hz, 7 Watts
		Four "D" Batteries
		RBD-1 Rechargeable Battery Pack
		External 6 V DC

# MODEL PMD221 TECHNICAL SPECIFICATIONS

Tape Drive System ..... Single Capstan Drive  
 Cartridge ..... Philips type compact cassette  
 Track System ..... 2-track 1-channel  
 Tape Speed ..... 1-7/8 ips and 15/16 ips  
 Heads ..... 3 Head System  
 Record: Super Hard Metal Alloy  
 Playback: Super Hard Metal Alloy  
 Erase: Dual Gap Metal Alloy  
 Motor ..... DC Servo Motor

## Frequency Response:

Standard Speed	Long Play
1-7/8 ips ( $\pm 3$ dB)	15/16 ips ( $\pm 3$ dB)
40 Hz ~ 12.5 kHz	40 Hz ~ 6.5 kHz
CrO <sub>2</sub> Tape	40 Hz ~ 14 kHz
Metal Tape	40 Hz ~ 15 kHz
	40 Hz ~ 8.5 kHz

## Signal to Noise Ratio:

Normal Tape	55 dB
CrO <sub>2</sub> Tape	57 dB
Metal Tape	57 dB

## Wow and Flutter (WRMS)

Standard Speed 1-7/8 ips	0.12%
Long Play 15/16 ips	0.15%

## Output Level/Impedance

Line	650 mV/2 k ohms
Headphone	280 mV/8 ohms

## Input Sensitivity/Impedance

Line	40 mV/56 kohms
Microphone	0.3 mV/9 k ohms

## General:

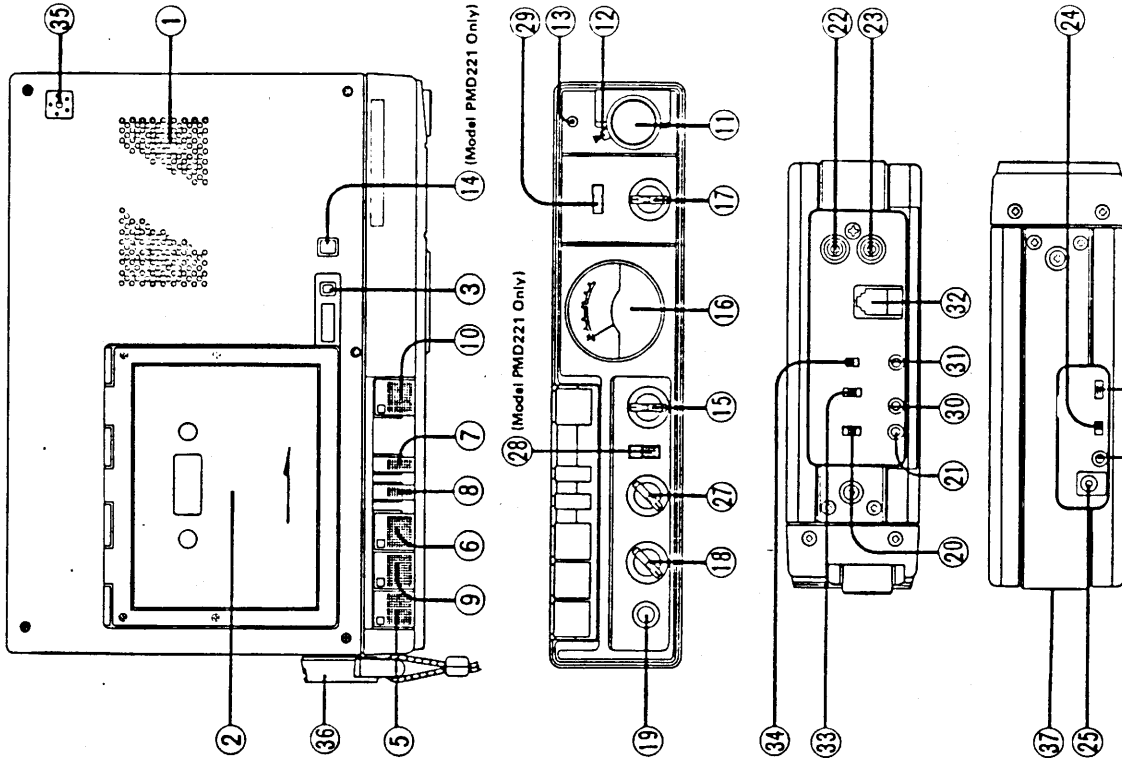
Power Requirements ..... 120 V, 50/60 Hz  
 Battery Requirements (RB430 Battery Pack Optional) ..... 3 D Cells or RB430 Rechargeable Battery Pack

## Battery Life

With Alkaline Batteries  
 Playback Time ..... 7.5 Hours  
 Recording Time with Metal Tape ..... 5.5 Hours  
 With RB430 Battery Pack (optional)  
 Playback Time ..... 4.5 Hours  
 Recording Time with Metal Tape ..... 4.0 Hours

## Unit Dimensions and Weight

Width	228 mm (9")
Height	51 mm (2")
Depth	165 mm (6.5")
Weight	1.3 kg (2.87 lbs.)



**NON OBVIOUS CONTROLS**  
 4 - Type Selector; 11 - Record Level; 12 - Record Indicator; 13 - Low Bat. Indicator;  
 15 - Tape Speed; 18 - Output Level; 19 - Headphones; 20 - Attenuation; 21 - Mic; 22 -  
 Line In; 23 - Line Out; 24 - Ext. Speaker On/Off; 25 - 4.5V DC Input; 26 - Ext. Speaker  
 Out; 27 - Tap; 28 - Monitoring Source Select; 29 - Hi/Lo Tape Speed; 30 - Remote; 31 -  
 Telephone In; 32 - Modular Telephone; 33 - Audio Filter Select; 34 - Input Port Select;  
 35 - Mic.

# THE MODEL PMD•221

JOHN H. BRYANT

Two years ago my Sony/Superscope cassette recorder finally "went belly up" after almost a decade of heavy use. I had gotten a little lucky and had some spare cash for a change, so I decided that I wanted to get a VERY good cassette tape recorder. I wanted it to be a large portable with a Nicad pack because I was planning to get into DXpeditions in a big way. I also wanted it to be reasonably rugged 'cause the way that I DX tends to put a lot of stress on the gear. I happen to know some of the folks in network news, so I asked them what they used for remote work. The standard of the news industry used to be a Sony portable which retailed for around \$500.00...beyond my price range. Luckily, my friends said that the machine of choice at this time was the Marantz 221, available for less than half that figure. I swallowed hard, and bought the darn thing. What's more, I forked over an almost incredible \$49.00 for the Nicad battery pack and another \$20.00 for a vinyl (vinyl!) carrying case. Was I nuts?? Heck, yes. Am I glad that I did it? You bet! The 221 has made more difference in my capabilities as a DXer than any other piece of peripheral equipment.

The older Marantz PMD 220 and its replacement, the PMD 221 are cousins with almost identical capabilities. However, as you can see from photos at the beginning of the article, the 221 is a completely new design - the layout of the instrumentation and controls is completely different, with the 221 having recessed controls and a "more modern" all black look. The 221 is also somewhat lighter weight and slightly smaller.

## What do I like about the machine??

A) I like the fact that I can use any other function control while the thing is playing back- I can Fast Forward or more importantly, Fast Reverse while the recorder is in either the Record or the Play mode. I can even have the thing in Play Mode, push the Pause button to stop everything and then use Fast Forward and Reverse. Of course, as Fritz mentioned, the 221 also has the Memory Rewind feature. This is all incredibly handy while trying to decipher a difficult ID. By simply lightly touching the FR button (lightly so that it won't lock down) I have listened to a 5 second ID for 10 times in a row in an elapsed time of less than 1½ minutes. THAT'S HANDY!

B) Like Fritz with the 220, I like the "Pitch" control which lets me vary the tape speed ± 20% to help decipher an ID or to compensate for having recorded the thing using a very under-charged battery pack.

C) Apparently the Marantz people solved the audio problems with the slow speed recording function of the 220, 'cause I cannot discern any audio quality loss with the slower speed on the 221, though I'm sure that there must be some. I'd use the 15/16 ips speed all the time but then my tapes wouldn't be compatible with most other folks or with most gear at stations. The obvious application for this capability is in timer driven "hands-off" DXing while asleep. Using the slow speed, I get 90 minutes of monitoring on one side of a C-90 tape.

D) I like the overall audio quality of the 221. The DX signals which make it to our receivers already have badly battered audio, so we need every bit of audio fidelity that we can get. Chuck Rippel's work at the end of the article and the 221's use in the broadcast industry both speak to excellent audio fidelity. I also like the on-board audio filtering. Three filtering settings are possible: "Normal" full audio spectrum, a "high cut" filter or a "high and low" cut filter. For DX work, I leave the filters in the latter position and it does help a good deal. (Refer to the test section by Rippel). I am also

glad that I invested in the third head so that I can monitor what is actually recorded on the tape while the recording is being made. This also lets me hear the internally filtered audio, so I sometimes DX with the tape recorder in the headphone circuit.

E) The accessories which I purchased, the Nicad pack and the padded vinyl carrying case also turned out to be extraordinarily well conceived. The Nicad pack, which I have used extensively, seems to take and hold a charge much better than any other such battery pack that I have ever used. The vinyl carrying case is meant to protect the recorder WHILE IN USE in the field. It is so well designed that I leave the 221 in its case even while using it in the shack. The portability of the unit due to the extraordinary battery and case has led to all sorts of unanticipated uses from recording owl hoots at midnight in December, to taping business meetings. These accessories have both repaid their cost many times over in the two years I have owned them.

F) I also like the slide switch that lets me select between the three input ports while recording. I input the radio directly thru the "Line In" port. However, when I want to make a comment on the tape or state the time, etc, I just slide the input switch to "Mic" momentarily which activates a super sensitive on-board mike. That's alot handier than pulling and pushing plugs frantically.

G) I also like the 1/4" headphone jack. That's handier than the mini-jacks and, along with the battery pack and the case, tells me that I'm dealing with professional gear.

That's about it on the plus side. There is an awful lot to love about the Marantz PMD-221.

**What do I NOT like about the PMD-221? Just two things:**

A) I hate the darn little slide switches on the right hand side of the recorder. These control the attenuation pad, the audio filtering and the input ports. These switches are just too small and too hard to see. Their size is no doubt a result of the whole miniturization trend of the electronic industry. I would have gladly accepted a recorder one inch wider and a few grams heavier to get these controls at a reasonable scale. The left side slide controls are also too small. They control the external speaker and tape type selection. Happily, all main controls are of good and comfortable size.

B) I am concerned about the speed control problems noted in Chuck's bench test. As Chuck presumed, I also think that the problem stems from the design feature which allows the operator to control the tape speed  $\pm 20\%$ . Frankly, I am not concerned about the .5% speed deviation and the mediocre wow and flutter numbers. What bothers me is that three times in the past year, the speed control on my machine has "gone nuts" and run the tape at two or three times normal speed! Each time this has happened, I have been able to "calm it down" by flipping switches back and forth a few times. This may be a peculiarity of my unit; I just don't know, but it is scary! However, I must have at least a thousand very hard hours on it and it is still doing well with no other problems.

Would I recommend the Marantz 221? Yes! It has given very good service and, with the extraordinary battery pack and carrying case has become a useful and incredibly flexible companion with many uses that I never anticipated when I bought it.



A TECHNICAL REVIEW  
OF THE  
MARANTZ PMD-221

R. CHARLES RIPPEL

The review panel of Fine Tunings Proceedings thought that a technical overview of the Marantz PMD-221 tape deck would be an appropriate accompaniment to the hands on review of the unit by Fritz Mellberg and John Bryant. While these tests are not nearly as permeated with level of procedure as say, an identical test done by Stereo Review, the figures produced are a result of the use of much the same type test equipment. In fact, if any readers are Hi-Fi enthusiasts and read such publications regularly, they will notice that the many of the test graphs are identical in format and basic content.

The conditions of the test are as follows:

Unit Under Test: Marantz PMD-221, serial number 6XU20034  
Age: 7 Months

Test Equipment: Sound Technology 1500A, serial number 117-02312

Last Calibrated: October 1983 by Sound Technology

Standard Test Tapes:

Teac MTT-150, 200nWb/m to establish OVU.

Teac MTT-111, 3Khz tone used during speed accuracy and wow & flutter tests.

Maxell UDXL II C-90, high bias blank tape premium tape for applicable record/playback tests.

Realistic "Concertape" low bias blank tape for applicable record/playback tests.

Test Weighting: NAB Standard.

The use of Teac test tapes is fairly standard in the industry. Other manufacturers, such as Nakamichi, require use of their own

tapes due their non-standard design approach to such things as playback equalization.

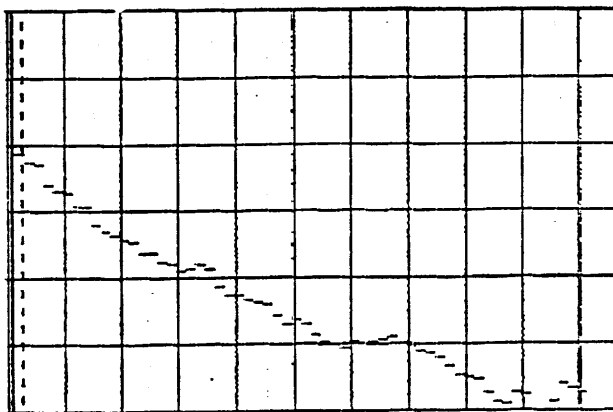
The testing was done at Audio Video Service Labs, Inc., here in Virginia Beach, VA, a factory authorized Marantz Service Center. Unfortunately, we were lacking service documentation for this current line model. This inconvenience is an unfortunate trend that consumer electronics suppliers must contend with these days. Since the owners manual contains no specifications, we have no "official" specifications to compare results with.

Adjustments or modifications made to the unit under test were limited to: cleaning the head, pinch roller and capstan along with a very necessary motor speed adjustment. An explanation of the reasoning behind the motor speed adjustment is noted in that section of this test report.

### Speed Test:

This test is designed to detect both short and long term tape speed inaccuracies. It is performed by playing back the Teac MTT-111 3 khz test tape and monitoring the "line out" of the tape deck under test. The test is 600 seconds long.

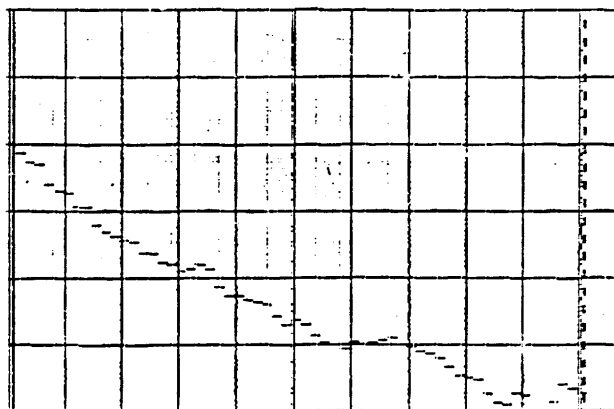
SP



Graph #1 represents test results after 10 seconds. Note the position of the dotted line. This was virtually the beginning of the test. The numeric figure in the bottom area of the graph to the right of the "L" shows the tape speed being about .179% fast as noted by the (+). An acceptable test would show the deck tracking speed basically along the center horizontal, 4th from the top, gradual.

Graph #1

SP



0.2%/D L-0.552%

600 SEC

Graph #2 shows the final result of the test. After 600 seconds, again note the position of the dotted line, the tape speed changed downward leveling off .552% slow. Again, note the sign in front of that number. This is unacceptable. Had I not had previous experience with other PMD-221's, I might consider replacing the motor on this unit. However, I know that motor design is perhaps the biggest flaw in the PMD-221. Speed inconsistencies plague the unit to the degree that changes could be noted if the set is even turned upside down. This was the case when I adjusted the motor speed of

### Graph #2

the unit in order to test it. Initially, the speed was so fast as to be beyond the ability of the Sound Technology 1500 to measure it. I set the speed nearly perfectly from the bottom of the unit but found when the unit was turned right side up for use, the speed changed significantly. Through a rather archaic process of turning the unit upside down for adjustment then right side up for measurement, I was eventually able to adjust the motor speed properly. During this process, I found that the unit would not return to the speed set once it was cycled off and on. Mind you the speed errors noted during the on/off cycling are not great and are perhaps inaudible by most. The results of this test do indicate a poor speed regulation design. Perhaps the design approach taken was necessitated by the "pitch" control on the front panel.

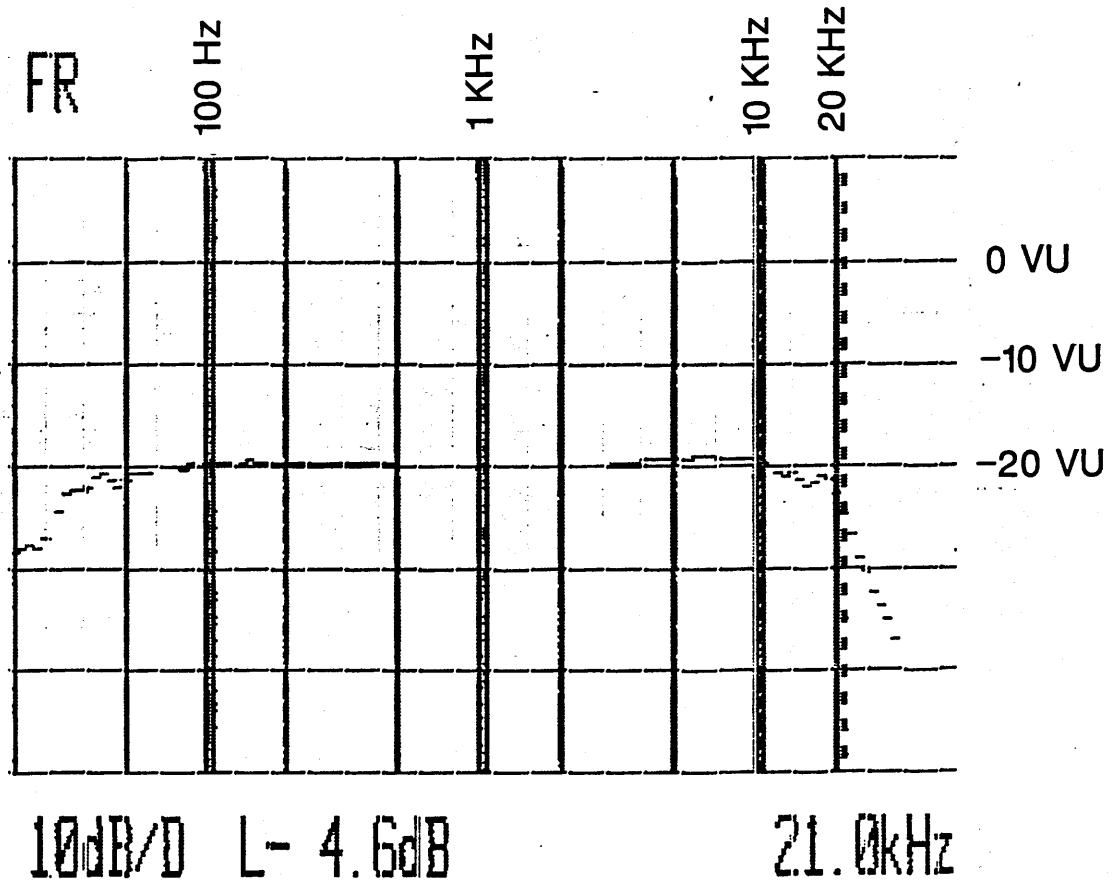
No tests were made with C-30, 60, or 120 formats to see if the poor speed consistency results were due to the varying lengths of tape loading down the drive system. Changing from DC and AC power was tried but yielded virtually the same results.

Wow and flutter was found to be a very mediocre .087%. Realize that .1% is considered unacceptable by most audio reviewers.

**Frequency Response Test:**

When used in SWL applications, HI-FI frequency response performance is not a prime consideration. However, the PMD-221 did turn out some very respectable numbers! First, "0 VU" on the unit was established as a reference level by playing back the 200 nWb/m Teac MTT-150 test tape. Frequency response tests were made -20 db down from this level, a method which is an industry standard. The first tests were made using Maxell UDXL II high bias "chrome" tape.

As this graph is logarithmic in it's scale, I have penned in limited numerics to assist in interpretation.



**Graph #3**

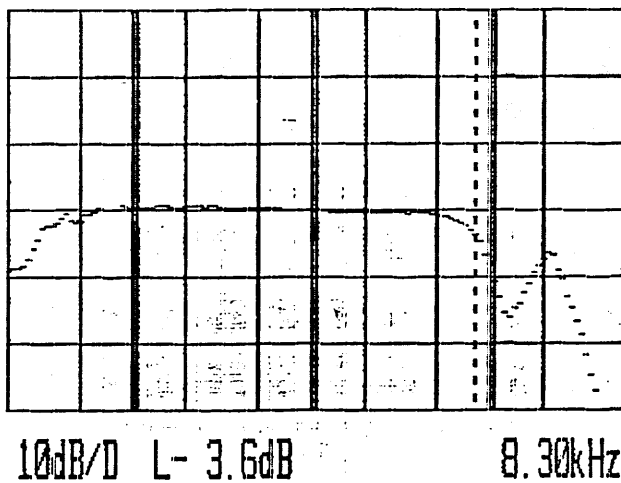
Graph #3 shows frequency response as measured between the -3 db points, an industry standard, to be about 31 - 20.5 kHz. This is excellent performance on a par with many expensive home units. Broad frequency response is a two edged sword and can be a liability in this application. DX'ers are primarily interested in the audio spectrum primarily centered on "voice" frequencies,

300 hz through 3 khz. Any other recorded sound, such as static, rumbles and receiver "shot noise" can be regarded as extraneous, unwanted sound even though our "high dollar" cassette recorder faithfully records and reproduces it.

Since most recordings made under "real world" conditions do not average 20 db below "0 VU", a second frequency response test was made and is represented below by Graph #4. During set up for the test, we found that the Teac MTT-150 produced an audio output of 460 MV which measured just short of the red area of the audio level meter of the PMD-221. Using 460 MV as a reference for "0 VU," the test was run at that level.

As you can see from graph #4, while the frequency response at the low end of the scale was not greatly affected, high frequency response suffered as a result of tape over-saturation. The 3 db points on this test occurred at about 30 - 8.3 kHz. These are respectable numbers with the frequency response drop off attributable mostly to the slow, 1-7/8 IPS cassette format tape speed rather than a design shortcoming in the cassette deck itself.

FR

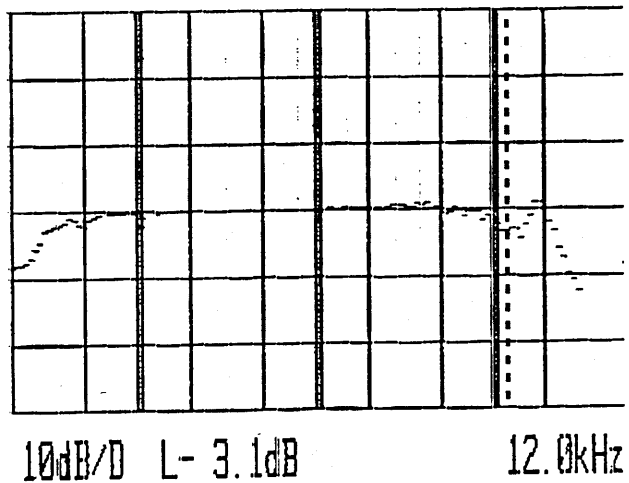


Graph #4

Since many of us do not always use the more expensive high-bias chrome tapes for day to day recordings or for use as taped reports to broadcasters, I thought it might be interesting to run the same test with an expensive yet widely available low bias tape. Realistic "concertape" in the C-60 format was chosen.

As illustrated in Graph #5, frequency response, although diminished at the high end, was a respectable 31 - 12.0 kHz.

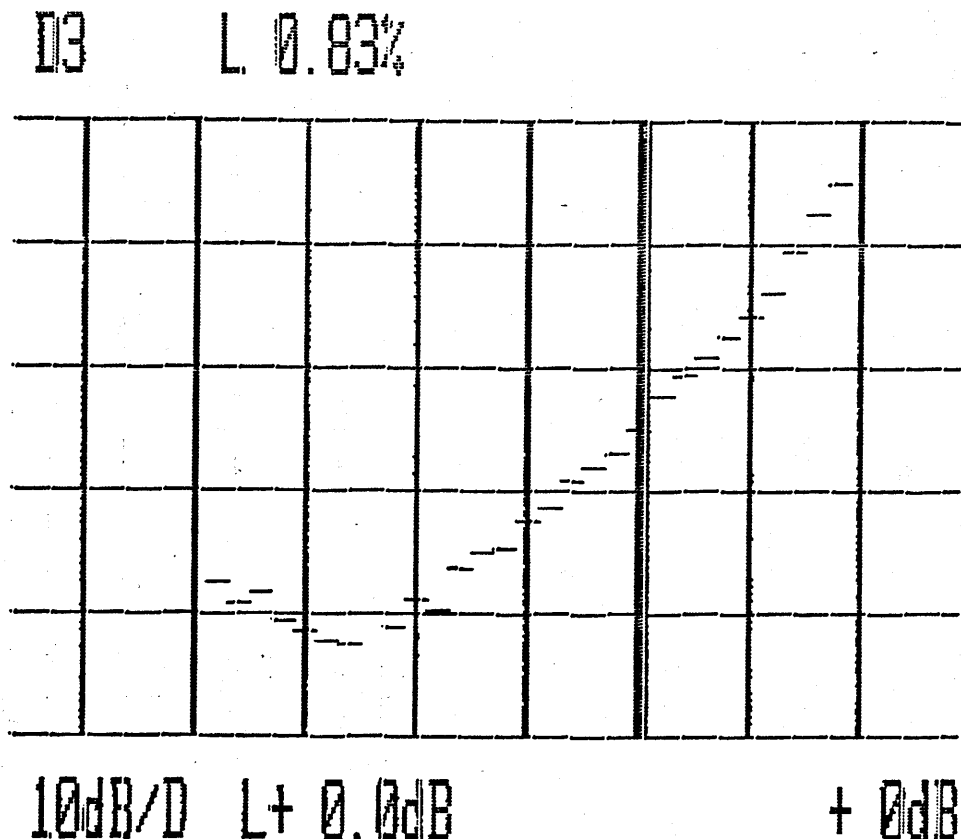
FR



Graph #5

### 3rd Order Distortion Test

This test measured the total distortion of the record/playback system. Graph #7 represents the results. Again, "0 VU" was used as a reference point. The test begins with a tone which starts 10 db stronger than "0 VU" and then steps down to -20 VU. The outcome of this test will vary with the type of tape. Maxell UDXL II was again used. As with most cassette recorders, one can expect worse results with low bias tape and even poorer results with "metal" formulated tape.

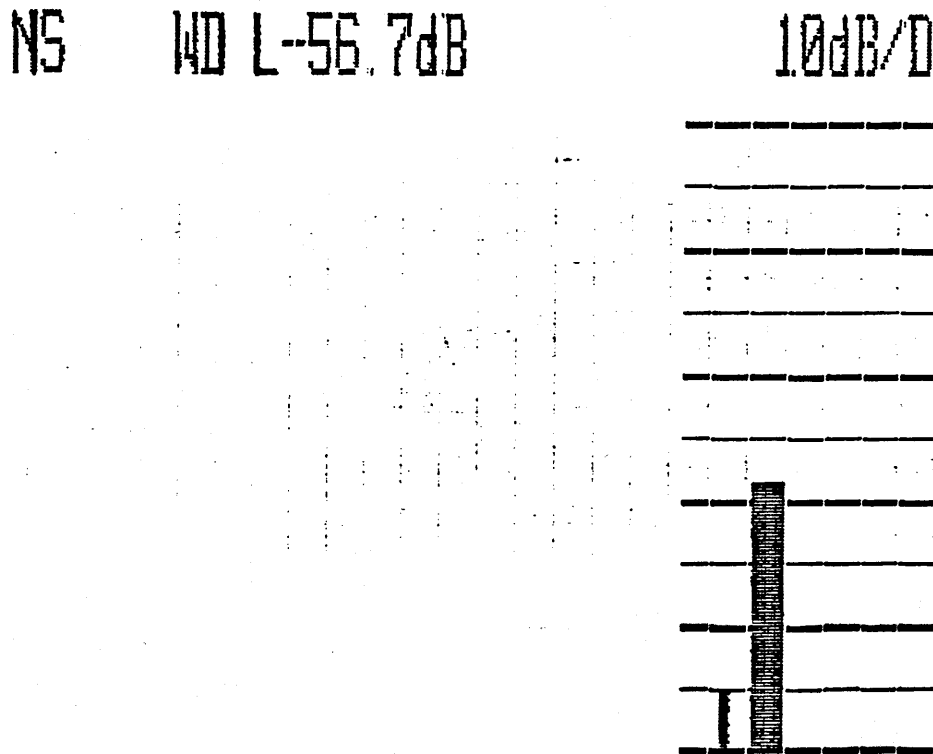


Graph #7

In this case, the vertical dotted cursor is hidden by the double vertical gradual indicating "0 VU" which is the 6th gradual from the left. Distortion at the "0 VU" point is indicated in the upper left hand corner as .83%. For our tests, distortion minima was found to be .1% and occurred -14 db from "0 VU." The point where 3% distortion occurs, an indication of the headroom of the machine, was measured at +6 db, an average figure considering todays technology.

**Signal to Noise Test:**

The signal to noise ratio, how quiet and free of both internal and externally generated noise a tape deck is can be one of the more important specifications. Graph #6 represents playback signal to noise ratio on an blank, unused tape as compared to the established "0 VU" level.



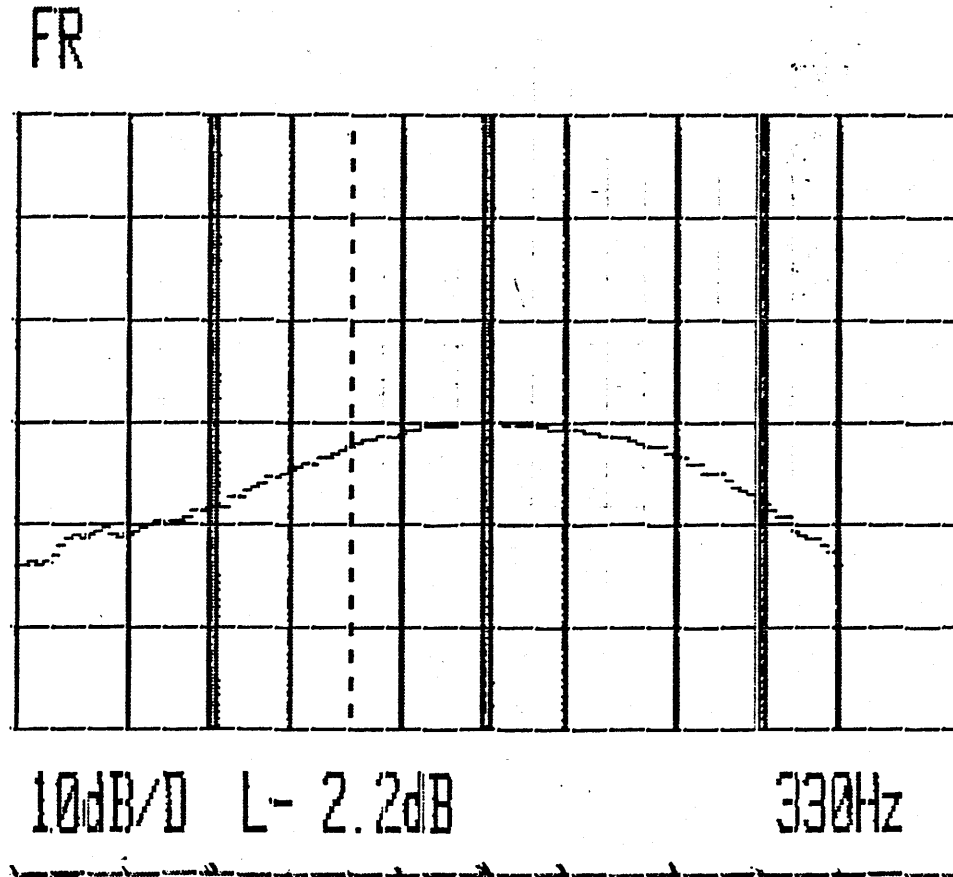
**Graph #6**

Here, a result of -56.7 db was obtained. A second test was made by recording a 460 MV signal, "0 VU" then erasing it and measuring the result which tests the effectiveness of the erase system. The same -56.7 figure was obtained. Although the PMD-221 has no noise reduction circuit such as dolby or DBX, it is quiet enough without those features to be generally acceptable.

A note about the signal to noise test. This figure may be considered accurate to within about 3 db either way. No attempt was made to make the test in an entirely noise-free environment. For those who may want to challenge the results of this test know in advance these conditions may have a slight influence on the outcome.

**Other:**

The Marantz PMD-221 has two additional audio inputs on the right side of the unit suitable for a telephone and external microphone. The inputs can be affected with a switchable -10 and -20 db pad, a band pass as well as a high pass filter. I thought it might be interesting to illustrate the characteristics of the band pass filter. Again, the heavy vertical double line in the center of scale represents 1 kHz.



**Graph #8**

The filter was found to be approximately a .5 db per octave filter centered on 1 kHz. It has a little over 1 db of attenuation at the edges of the "accepted voice band" of 330 - 3.3 kHz. It had about 13 db of ultimate rejection which occurred at 20 Hz and 20 kHz. Not a very effective filter really but it might be just enough to eliminate some incoming extraneous noise.

The PMD-221 also has a switchable "record mode" selector enabling the user to set the record levels manually, engage a limiter circuit or ALC circuit. It was found that the limiter was especially effective clamping the signal quickly as it began to



rise above 467 MV. This effectively kept the signal from exceeding "0 VU" but for a few milliseconds. The limiter might be especially effective for SWL's by setting the average record level just below "0 VU" and allowing the limiter to clamp any static crashes or other drastic changes in audio amplitude. I found the ALC mode unusable as it maintained audio input well over "0 VU" which resulted in a distorted recording.

#### **Final Technical Evaluation:**

There turned out to be one minor and one major flaw in the Marantz PMD-221 found as a result of my evaluation. I found that when used with an external timer, such as might be the case when using the recorder in conjunction with the NRD-525 in the timer mode, damage to the pinch roller is possible. When making delayed recordings with the PMD-221 using a timer, the user must plug the switch contacts of the timer into the unit through the "remote" jack in the side of the unit. The unit is then placed in the record mode. When the timer comes on, it's switch contacts close and turn the tape recorder on. The problem arises when you place the unit into the timer record mode, the pinch roller presses the tape against the capstan. This in itself is no real problem until you consider what happens when you set the system with a timer to record a selection several hours ahead. The pinch roller stays pressed against the capstan and a real danger exists that the capstan will press a notch in the soft rubber pinch roller. If this happens, every 360° of pinch roller rotation you might experience a mechanically induced speed abnormality as a result of that notch.

Although the overall audio performance of the PMD-221 is excellent, it's transport and supporting mechanism are it's most serious drawback. The basic audio performance is as good as found in many high priced home decks. The perspective buyer might first consider the problems encountered with motor speed drift and basic transport reliability before making a purchase decision.