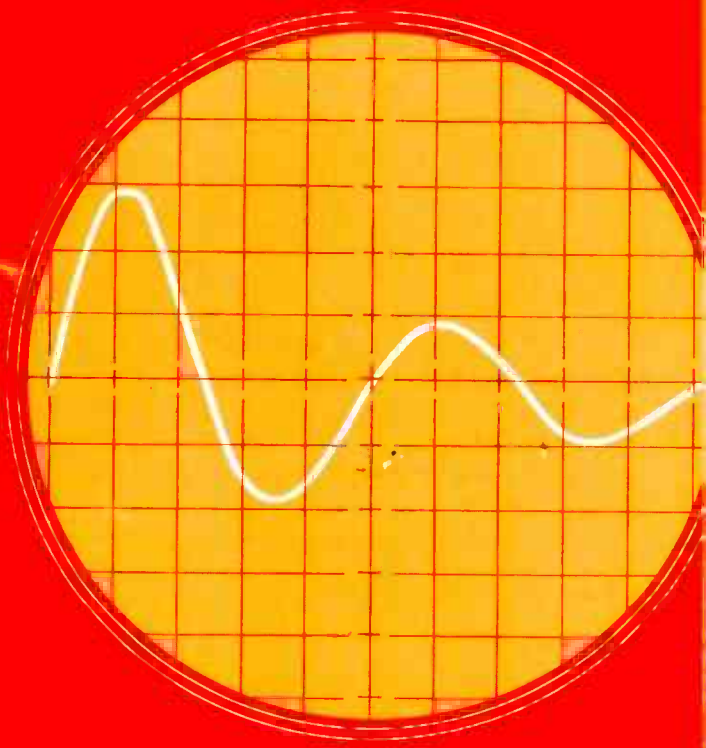
SERVICING ISSUE



- CB Servicing Notebook
- Television Casebook

nri journal

Winter 1979

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nri journal

Winter 1979
Volume 37, No.1

In this issue, NRI student/author Harold Kinley details some of the CB audio servicing problems he's encountered recently. And, once again, we hear from Wayne Brandenburg, who always relates some very interesting case histories of television servicing calls.

The NRI Journal (USPS 399340) is published quarterly by the National Radio Institute, a division of the McGraw-Hill Continuing Education Center, 3939 Wisconsin Avenue, Washington, D.C. 20016. The subscription price is two dollars yearly or 50 cents per single copy. Second-class postage is paid at Washington, D.C.

Harold Kinley

CB SERVICING NOTEBOOK

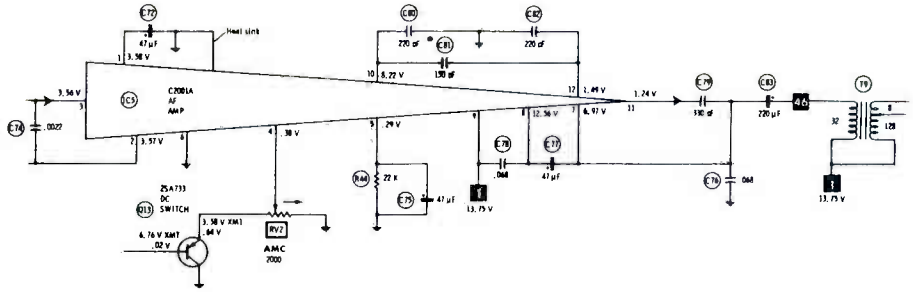
This time: audio problems!

Case Histories in CB Radio Servicing

Somehow it seems that CB problems come in batches. One day, I worked on several sets that had microphone problems. Another day, it was transmitter rf amplifier failures. In this article, I'm going to relate some of the audio servicing problems I've had.

MIDLAND 77-808

The owner of this set said that it received fair, but had no modulation. The set seemed to have fair audio output from the receiver, but there was only a slight trace of any modulation on the carrier. I decided to check the audio output power from the set on my audio power meter, which is built into the B



Courtesy Howard W. Sams

FIGURE 1. THE AUDIO AMPLIFIER OF THE MIDLAND 77-808.

and K 1040 Servicemaster. I fed about a 30-μV signal at 30 percent modulation into the set and turned the volume control all the way up. I was surprised to see that the audio output was only 0.25 watt! Now this is not nearly enough audio power to fully modulate a 4-watt carrier output. According to theory, the modulator must be capable of delivering 50 percent of the carrier power to fully modulate the carrier to 100 percent. This may not hold exactly true for CB transmitters where the driver transistor and the output transistor are both modulated. However, any CB output should be at least 2.5 to 3 watts with less than 10 percent modulation.

With this in mind, I started checking the audio amplifier circuitry. In this particular set, the entire audio amplifier is an IC (IC5 in Fig.1). My first suspicion was that the IC itself was at fault. I checked the voltages at all the pins of the IC and they were all very close to those shown on the schematic. This temporarily removed my suspicion of the IC. Next, I hooked up my probe to my oscilloscope to do some signal tracing. I touched the probe to the input of the IC (pin 3) and turned down the volume control until I had about half scale peak-to-peak deflection on the screen. At pins 7, 8, and 11 of IC5 there was a high amplitude signal, but at point 46 (the top of audio transformer T9), there was only a very low level signal. After studying the schematic, I decided to bridge capacitor C83 with a good 220-μF capacitor. Upon bridging C83, I noticed that the audio power meter jumped way upscale. As I removed the old capacitor, I could see that the bottom was bulging out. These electrolytics frequently do this when they are bad. Replacing the capacitor cured the trouble. The amplifier was now capable of putting out 5 watts audio. I also rechecked the modulation, which was very good now: 100 percent with a beautiful pattern.

REALISTIC TRC-56

The customer who brought in this set said that he had loaned the set to someone and it was returned in an inoperative condition. He wasn't sure just what had happened to the set. When I got around to checking the set, the first thing I noticed when I applied dc power to the set was that the current drain was high (around 500 mA) in receiver standby mode. I keyed the transmitter and a clean looking carrier appeared on the scope with 4 watts indication on the rf wattmeter. Then I whistled into the microphone but there was no sign of carrier modulation.

At this point, I removed the cover from the set to have a look on the inside. (After all, the trouble was probably inside the set!) A visual observation around the audio section showed that things had gotten pretty hot in there. The driver transformer (T701 in Fig.2) had practically melted! An inspection of the bottom side of the board revealed that the immense heat had caused the solder around Q702 to melt and form a solder bridge from emitter to collector.

Next, I decided to check the emitter resistors. I connected the ground lead of the ohmmeter to common ground of the set and touched the meter probe to the emitter of Q702. There was no continuity so I assumed that the 0.5-ohm resistor, R718, was open. Then I touched the probe to the emitter of Q703 and the meter read 0.5 ohm, so at least that resistor was okay.

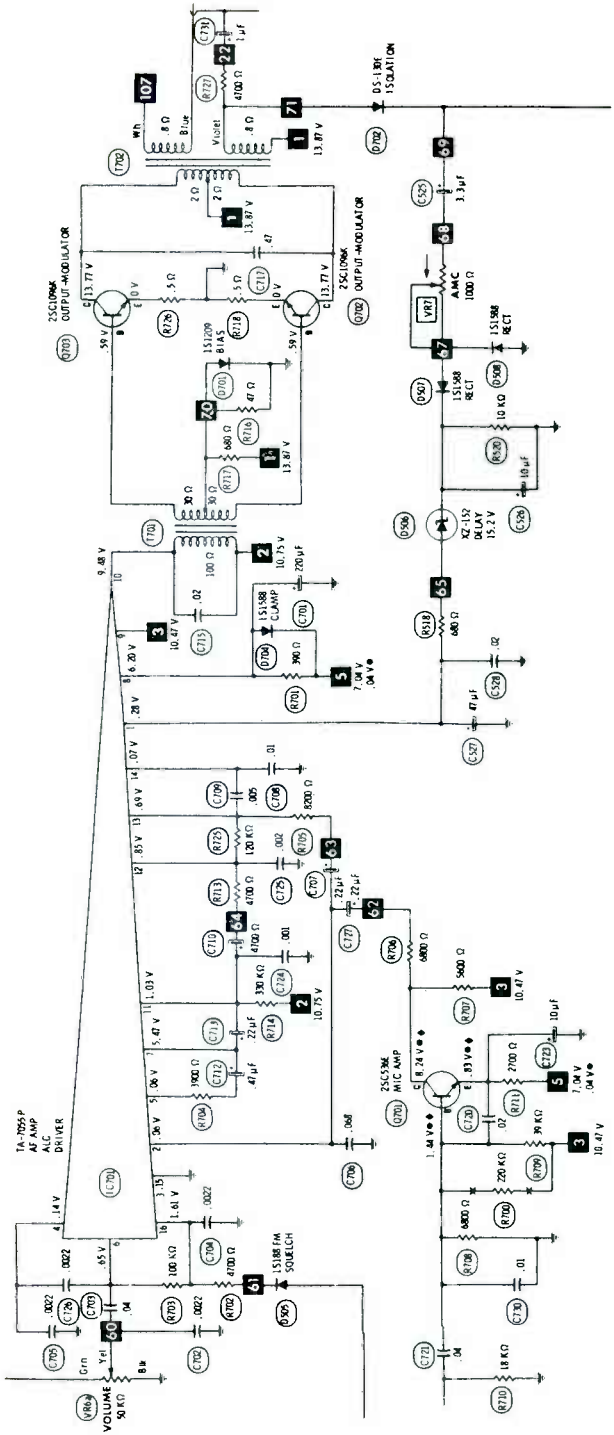
At this point, I happened to notice that the solder was melted around the lead of resistor R718 where the lead connects to the common ground on the circuit board. A resistance check from the resistor lead to ground showed an open, so the lead of the resistor had become unsoldered from the board when the temperature got so high. The resistor was not open after all. I re-soldered the resistor lead to the board, which solved that problem.

Next, I unsoldered the leads of Q702 from the circuit and checked it on my transistor tester. It was defective. With the leads of Q702 disconnected from the board, I reapplied power to the set while carefully watching the current drain meter on the power supply. The current drain was still high, so even though Q702 was defective, it wasn't causing the high drain.

Next, I disconnected Q703 and checked it on the transistor tester. I found that there was a short from base to collector in the transistor. With the leads of Q703 disconnected, I once again applied power to the set. This time the current drain meter read 250 mA (normal), so Q703 was causing the high current drain. A look at Fig.2 will show why. Current would flow from ground through D701, through the top half of the secondary of T701, through the base-to-collector short of Q703, then through the top half of the primary of T702 and back to supply voltage point 1. At this point I became suspicious of diode D701 (bias diode). Using the ohmmeter, I checked from point 70 (top of the diode) to ground and found there was a direct short. The diode was apparently gone, too.

According to the schematic, the two halves of the secondary of T701 should measure 30 ohms each. However the ohmmeter showed the top half to be 0.5 ohm and the bottom half to be 0.7 ohm. At this point, I removed T701 from the board. I double checked the resistance readings of the transformer. The results were the same as with the transformer in the circuit. I knew by now that the transformer would have to be replaced, but I made some more ohmmeter checks on the transformer just out of curiosity. I found that the resistance of the primary winding was 90 ohms (about what the schematic called for). Also, I found that there was a short from the primary to the secondary winding.

At this point, I became concerned about whether or not the audio IC, IC701, had survived the ordeal. I decided to feed a modulated signal into the receiver to do some signal tracing around audio IC701. Since I had removed T701 from the circuit, I would have to substitute a resistor for the primary of T701, because pin 10 of the IC connects back to the supply voltage point 2 through the primary of T701. I temporarily connected a 120 ohm resistor where T701 primary would normally be connected. I



Courtesy Howard W. Sams

FIGURE 2. THE AUDIO CIRCUITS OF THE REALISTIC TRC-56.

applied power to the set and turned the volume control about half open and the squelch control fully counterclockwise. I touched the signal tracer probe to pin 6 (the input side of the IC). The tone from the modulated signal came through the signal tracer speaker loud and clear, so I turned the volume on the tracer down to a low volume. Then I touched the signal tracer probe to pin 10 (the output side of the IC) and the volume was much louder there. Apparently the IC had escaped unharmed. I removed the resistor that I had temporarily connected to the IC.

Since there was so much damage in the audio output section, I decided that I should check the audio output/modulation transformer, T702. With the audio output transistors both disconnected, the only thing left connected to the transformer primary was the 0.47-μF capacitor, C717. I connected the common lead of the ohmmeter to the center tap of the primary and then touched the probe to one side of the primary. The meter showed approximately 1 ohm resistance. Touching the probe to the other side of the primary showed a resistance of 0.3 ohm. This meant that T702 was also bad. I had an output transformer on hand to replace T702. I went ahead and removed T702 to replace it. With T702 out of the way I could get to diode D701 a little easier, so I replaced D701 and then installed the new audio output/modulation transformer.

At this time I also replaced both audio output transistors. The transistor type was 2SC1096. This type is used in many different CB sets, so I keep a few in stock. After replacing the diode, the output transformer, and the two output transistors, the only part left to replace was the driver transformer, T701. I did not have a good replacement for that one in stock, so I had to order one from Radio Shack in Ft. Worth, Texas.

I owned an old junk set which had a similar driver transformer in it. I removed it and checked the resistance of the primary and center-tapped secondary. The primary resistance was 175 ohms and the secondary measured 10 ohms from the center tap to either side. I decided to temporarily wire this in the set to see if the set would actually work. I did this and the set worked almost perfectly. The modulation looked very good, so I checked the audio output on the audio power meter. The set was delivering 10 watts of audio at maximum volume. I reduced the volume quickly from 10 watts to prevent the output transistors from getting too warm and blowing out again! At 2 watts audio output, the distortion was 10 percent. That's a little over the acceptable limit for me (though not too bad). Ten percent may sound terribly high for some audio enthusiasts who have gotten used to amplifier distortion figures in the range of a few tenths of 1 percent, but for CB output stages, distortion figures run generally 5 percent or more.

Having satisfied myself that the new transformer would restore the set to 100 percent fitness, I removed the temporary transformer and boxed up the radio for storage until the new transformer arrived from Radio Shack. The repair bill would run fairly high on the set, but I thought the set was worth the repairs. On some of the more inexpensive sets I would not have gone this far.

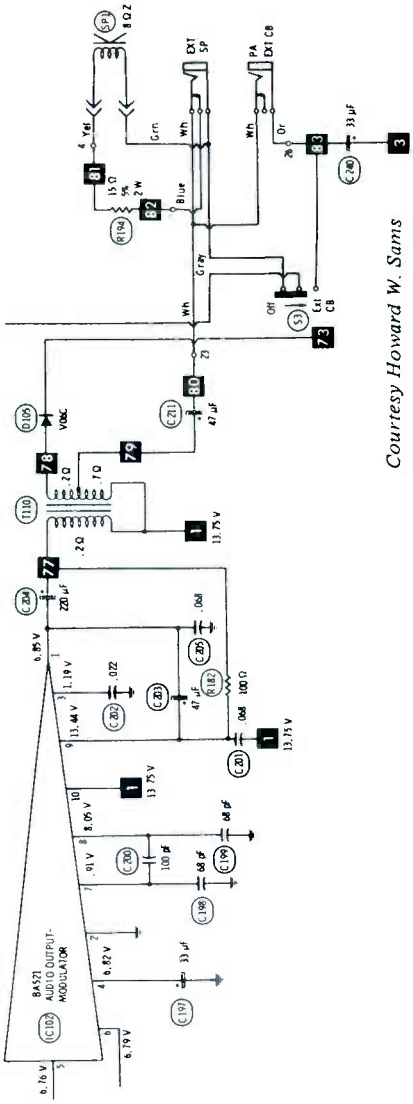
MIDLAND 13-830

At one time, this set had been hooked up backwards (reverse polarity). After that, the customer said, the set would blow a fuse repeatedly. The first thing that I did was to check the

polarity protection diode at the power supply input. It was shorted, so I left it out of the set temporarily to do some more checking. I hooked the set up to my bench power supply and test equipment. The ammeter on my power supply showed the current drain to be abnormally high. I made quick tests to determine what stages were working. I keyed the transmitter and the rf output power was normal (3.7 watts). I then whistled into the microphone while observing the scope for the modulation pattern. There was no modulation at all on the carrier. Next I fed a modulated signal into the receiver. There was a good indication on the "S" meter, but no sound from the speaker. Also, I noticed that the speaker itself was getting quite warm. The modulation transformer T110 was hot and some of the plastic around the top of it had melted.

At this point I removed the dc power from the set to prevent more damage. It looked like the trouble was probably confined to the audio stage (except for the polarity diode). After a little more visual inspection I also found that the plastic coating on the 220-μF coupling capacitor (C204 in Fig.3) had melted. I replaced this capacitor along with the output transformer. I applied power to the set again but the current drain was still too high (although not as high as before). There still wasn't any modulation or audio from the receiver.

At this point, I removed the audio IC (IC102) and replaced it with a TA7205P, which I usually keep in stock. Figure 3 shows the IC as a BA521, but this set had a TA7205P, so apparently the two ICs are interchangeable. I found out later that the BA521 has 12 pins instead of the 10 that the TA7205 has; however, the first and last pins on the BA521 are cut off short so as not to be connected in the



Courtesy Howard W. Sams

FIGURE 3. THE AUDIO CIRCUITS OF THE MIDLAND 13-830.

circuit. I don't know what those pins were put there for. I don't have any information on the BA521. The RCA SK replacement guide shows that an SK3231 IC will replace both the BA521 and the TA7205P. The SK3231 IC has only 10 pins. I usually order replacement semiconductors, ICs, etc. from FUJI-SVEA in Cincinnati. Their replacement parts are much more economical than the general replacement semiconductors.

Anyhow, after replacing the IC, I again fired up the CB to see what would happen. This time there was good audio from the receiver and good modulation on the transmitter; however, the current drain was higher than the normal drain. Not much higher, but enough to let me know that there were quite a few electrons in there that were still taking a short cut! Once again, I felt the speaker around the magnet and it was quite warm. I looked at the schematic and saw that the speaker was dc isolated from the output transformer by coupling capacitor C211, a 47-μF capacitor.

Using a voltmeter, I checked the dc voltage at point 80 on the schematic. To my surprise, I found 13.7 volts at that point! The capacitor must have been shorted, thus allowing the full supply voltage to be applied across the speaker input. I removed the capacitor and checked it on my ohmmeter. It certainly was shorted. Replacement cured the trouble and the current drain was now normal. If the speaker hadn't had the 15-ohm resistor in series with it, it would probably have burned out the voice coil. But the speaker still sounded fine, to my surprise!

Finally, I replaced the polarity protection diode and finished up the job. This particular call was certainly a classic example of what reverse polarity can do to a radio, although I have seen worse!

FULCOMM

The customer said that the radio did not work properly to begin with and that someone he knew worked on it for him and had made it worse. This set had a 2.5 mm coaxial type of power socket on it and the power cable was not with it. Someone had gone inside the radio and hooked up two wires to the coax socket in order to power the set. I hooked up the set on my workbench to check out the symptoms. I found that there was no sound from the speaker and when the microphone was keyed, the ammeter on the battery eliminator would swing over to full scale. I fed in a high level rf signal to see if the "S" meter would register and it seemed to register normal. This indicated that the rf and i-f circuits were functioning normally at least. However, no sound was getting on to the speaker.

The Sams CB manual index did not list a Fulcomm of this type so I had to set out on a search through my Sams manuals to find one that was identical to the Fulcomm. Sometimes I have been lucky at this and sometimes not. However, this time luck seemed to be with me because when I pulled out Sams manual CB-108 I found that the Alaron

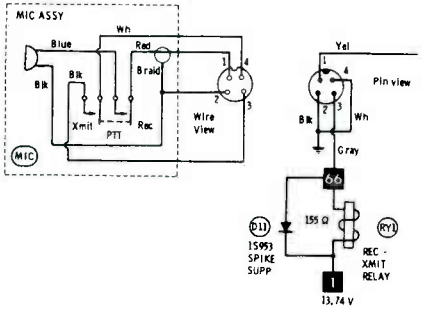


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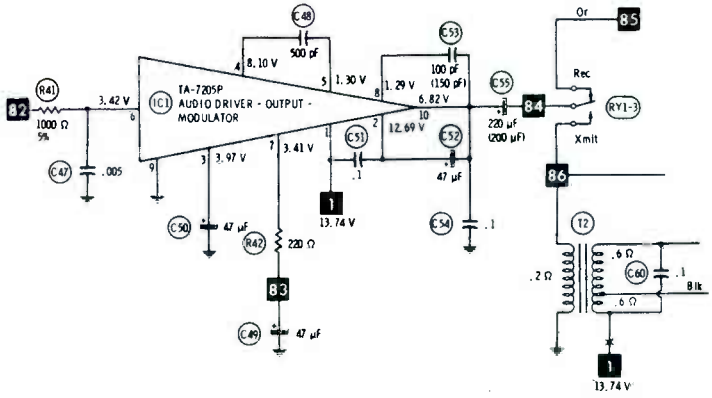
FIGURE 4. THE KEYING CIRCUIT OF THE ALARON B-1100.



Courtesy Howard W. Sams

FIGURE 5. THE AUDIO IC USED IN THE ALARON B-1100.

B-1100 was indeed identical to the Fulcomm radio. I determined this by carefully studying the circuit board detail.

I studied the schematic to see what could possibly be causing the high surge of current when the transmitter was keyed. I looked closely at the keying line and noticed that connected across the keying relay coil was a diode (D11 in Fig.4) used to suppress the voltage spikes caused by the inductive kick of the relay coil. I had a hunch that the radio might have been hooked up backwards. If it had, the diode might be shorted. I removed the diode from the circuit and my curve tracer revealed that it was indeed shorted. I then keyed the radio and the power meter showed normal power but there was no modulation. Apparently, whatever was causing the loss of receiver audio was also causing the loss of transmitter modulation. This is common since the same audio circuitry is used in both the receiver and transmitter modulator. I replaced the diode before going any further.

The next thing that I did was to study the audio circuitry on the schematic, which is shown in Fig.5. There I noticed that the audio section contained an IC which was used in both the transmitter and receiver. I first wanted to check out this IC, so using my signal tracer I checked for an audio signal at the input of the IC at point 82 on the schematic. I already had my signal generator feeding in a strong modulated signal to the receiver input. The signal tracer picked up the audio signal at the input to the IC. However, when I moved the tracer probe to the output of the IC the signal was lost. This pretty well pinned down the IC as the culprit. Replacing the IC brought back both normal receiver audio and transmitter modulation. The total cost of the repair job came to $26.95.

Editor's Note: Further information on the addresses mentioned in this article can be obtained by writing to the author:

Harold Kinley
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Wayne C. Brandenburg, C.E.T.

Television Casebook:

3. Portrait of a Service Technician

It was a chilly fall morning when I arrived at Jerry's service shop. Jerry was waiting outside in his van, sipping a cup of coffee. "Sorry to rush you off like this," he said, "but I have an early morning call — or 'call back' I should say — and the gal wants it fixed before she goes to work."

As we were driving, Jerry explained what he had done to the set previously. "It's one of those early Quasar remote control sets — the kind with the plug-in modules and four tubes in the sweep circuits. When I was there last week, the set had a really dirty tuner. I took the tuner out and put some tuner cleaner right on the contacts. That usually takes care of it for a long time. Also, she had a

problem with the remote control. Every time she dropped her car keys on the table or rocked in her squeaky rocking chair, the TV would change channels or the volume would increase. I couldn't find the 'remote sensitivity' control that most remotes have, so I put a little square of tape right in the center of the receiving transducer. That cut the sensitivity enough to make the set work right. This time she says the picture is gone. I don't think that any of my work could have caused that . . . unless I left a screwdriver or something in there."

When we arrived, Jerry took a few minutes to talk to the customer before looking at the set. He is actually a very good listener. The customer was quite nervous, and kept talking about the previous repair and Jerry's guarantee: ". . . parts and labor for ninety days."

Jerry, on the other hand, was relaxed. He has an air of confidence and friendliness that instills these same qualities in his customers. His calm attitude and professional appearance (the only repairman I have ever seen who wears a tie) always put the problem in the proper perspective. It's just a broken TV — not the end of the world.

In his examination of the set, Jerry found that there was sound but no picture. Then, by rubbing his hand across the picture tube face, he decided that there was no high voltage. Usually, if he feels a little charge on the screen and can hear the horizontal sweep circuits running, he knows that high voltage is present.

Looking through the vent slots at the back of the set, he could see that the filament in the damper tube was not glowing. He removed the back of the set and the damper tube. Then he looked through the glass envelope of the tube to see where the filament is connected to the pins. This is where the break usually occurs. It's amazing how much repair work can be done by sight and feel!

Jerry didn't see anything wrong with the tube but he tried a new one anyway. After a few minutes, the picture was restored. He then tried wiggling the tube and slowly the filament of the damper tube went out. He replaced the original damper and turned the television over (onto its face) so that he could see the bottom of the tube socket.

One of the socket wires was loose; evidently it hadn't been soldered at the factory. He called the customer over to look at the wire as he wiggled it with a long plastic tool.

While he was explaining the problem to the customer and the soldering iron was heating, I noticed that Jerry ran his hands over the tools in his box. This man must love his work! He charged his customer for a service call only (since no parts were used) and he explained his warranty once more to her.

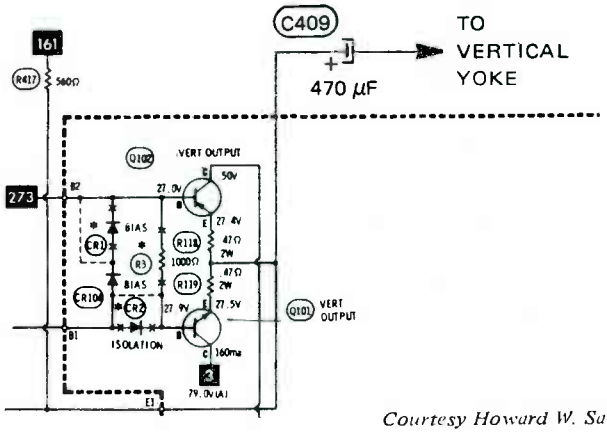
On the way to the next job, I asked Jerry about two points I had noticed. First, I asked how the customer became so well informed about his service policy. "Well, that's easy! Whenever a customer calls for service, I explain both my service pricing structure and my guarantee *before* I go out to the house. Then, when I arrive, I go through the whole thing again. I believe that a happy customer is one who receives *no* surprises." Then I asked him why he always shows the customer what he is doing to the set. "Why hide it?" was his reply. "If customers can see and understand what is wrong, they don't mind paying. The guys who act as if TV repair is some kind of mystery are the ones who have trouble collecting. A customer gets intimidated if you act like they won't understand your explanation."

We made two more service calls before lunch. The first one was a faulty turntable in a Magnavox home entertainment center. This system is a huge piece of furniture containing both television and stereo. The turntable ran very slowly, and actually stopped when put in the reject mode. Jerry removed the platter and watched the motor spindle for a second. Then he removed the entire turntable and disassembled the motor. His examination of the motor bearings revealed that the bottom bearing had a large amount of dried grease that caused the motor to turn slowly. He cleaned the bearing with a tuner de-greaser and relubricated it with oil. When he reassembled the turntable, it worked properly. He rested his hand on the moving platter and, deciding that the platter had enough torque, chose not to change the drive wheel.

The next service call was the delivery of an RCA chassis. This CTC60A chassis was one that Jerry had repaired in the shop. The symptom was no vertical deflection. Since the set has a modular chassis, he changed modules, but to no avail. Next, he checked the vertical output transistors. They were okay, so he took the chassis to the shop. Using his oscilloscope, he was able to find the bad part. In Fig.1, you can see a 470-μF capacitor that is in series with the vertical yoke. This capacitor is mounted on the chassis, and is almost impossible to find without taking the set to the shop. The capacitor was open, and replacing it cured the vertical problem.

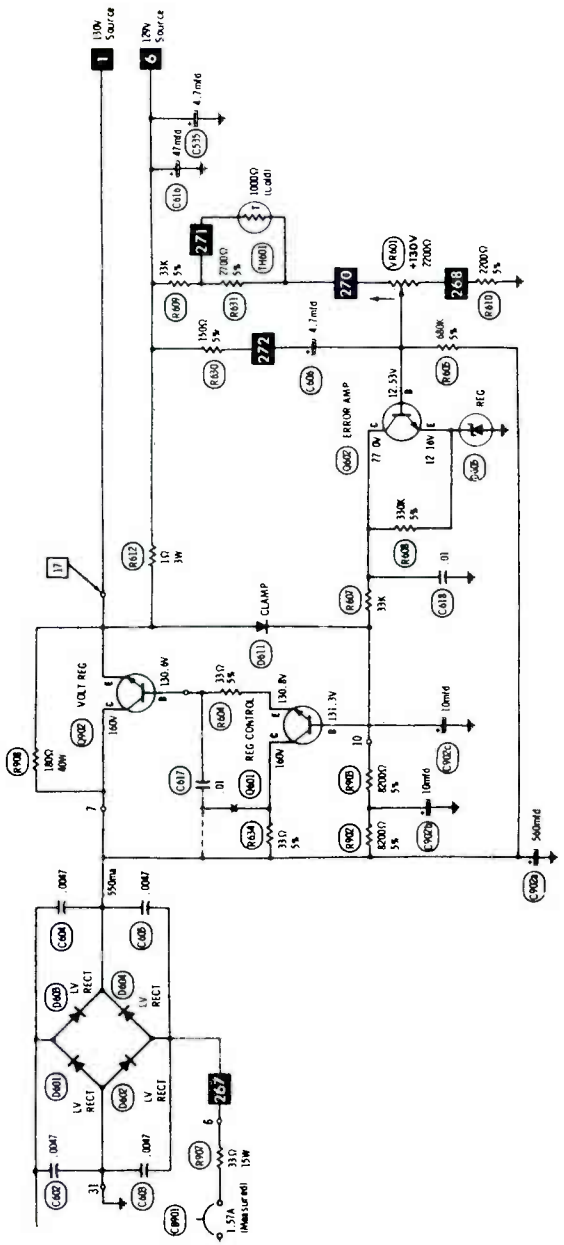
I carried Jerry's tools to the truck while he collected for his service. We returned to the shop where lunch was provided by his wife, Sarah, who had been watching the shop in his absence.

During lunch, I asked Jerry to explain his pricing structure. "That RCA chassis was a good example because it called for every charge I have. There was a $20 home service charge that I put on every service call. This includes going to the house and about 30 minutes work. If I can't figure out the problem in that amount of time, I take the equipment to the shop. That brings up another charge – pickup and delivery. I charge an extra $10 for the second trip to the house. You could call it a 'trip' charge, if you like. Then there is the labor charge. For color televisions,



Courtesy Howard W. Sams

FIGURE 1. THE VERTICAL OUTPUT STAGE OF AN RCA CTC60A.



Courtesy Howard W. Sams

FIGURE 2. THE POWER SUPPLY OF A SONY KV1710.

the total charge is usually about $38. This includes hooking the chassis to the test jig at the shop, locating the defect, ordering the parts, installing the parts, routine adjustment, and usually cleaning the tuner. Then, of course, there's the price of the parts. I always give an itemized list and I also give back the old parts and explain why they are bad. And there's tax also. This state gets 5% tax on parts only." Then I asked if his prices were based on his experience in working at other shops. "No," he replied. "My prices are the result of reading my profit and loss statement. The first year I was in business, I almost lost my shirt – Mr. Nice Guy, you know? Then I realized that with an honest approach and informing the customer of the reason for every charge, I could get my price *and* make a profit."

After lunch, I followed Jerry on two more calls. The first was a Sony KV1710, a 17-inch color set. When he first turned it on, the set made a humming sound for about one second and then the circuit breaker tripped. Jerry removed the back of the set and decided to check the B+ voltage first.

The Sony power supply circuit is shown in Fig.2. Transistor Q902 is a large TO-3 type that is mounted on a heat sink. When he touched the voltmeter probe to the collector (case) of the transistor and turned the set on for a second, he measured the advertised voltage of 160 volts. However, making a voltage test at the emitter of Q902 also produced a reading of 160 volts! Jerry assumed that the transistor was shorted and removed it from its socket.

With the transistor removed, he made a resistance check from emitter to collector to verify his diagnosis. Then he proceeded to check the resistance of the 130-volt source to ground. I asked him why he made this test. "Well, its unusual for a regulator to short like this without something else being shorted. Usually a horizontal output transistor or something is also shorted. This causes too much current to flow through the regulator. By checking at the voltage source for a low resistance, I can determine whether something is shorted. This one seems to be okay, so I guess the regulator was the victim of a line surge or lightning activity or something like that."

Replacing the transistor did cure the problem, so Jerry wrote up the bill while explaining it to the customer. Notice the additional labor charge added because the call took 45 minutes.

Home Service	$20.00
Additional labor @ $25/hr	12.50
Regulator transistor	8.95
Tax	.45
Total	$41.90

The last call was very strange indeed! The set was an RCA color with some interesting symptoms. The raster was shifted down the screen about two inches. The picture was very distorted and out of convergence, and the purity was bad. I had no idea what could cause this problem.

Jerry opened the set and found the problem immediately. This television uses a picture tube like the one shown in Fig.3. The yoke is permanently bonded to the back of the picture tube (or so they say). In this particular set, the glue had given way and the yoke was dangling loose on the picture tube neck.

The customer watched as Jerry moved the yoke around as a demonstration. "Now, what I can do is try to

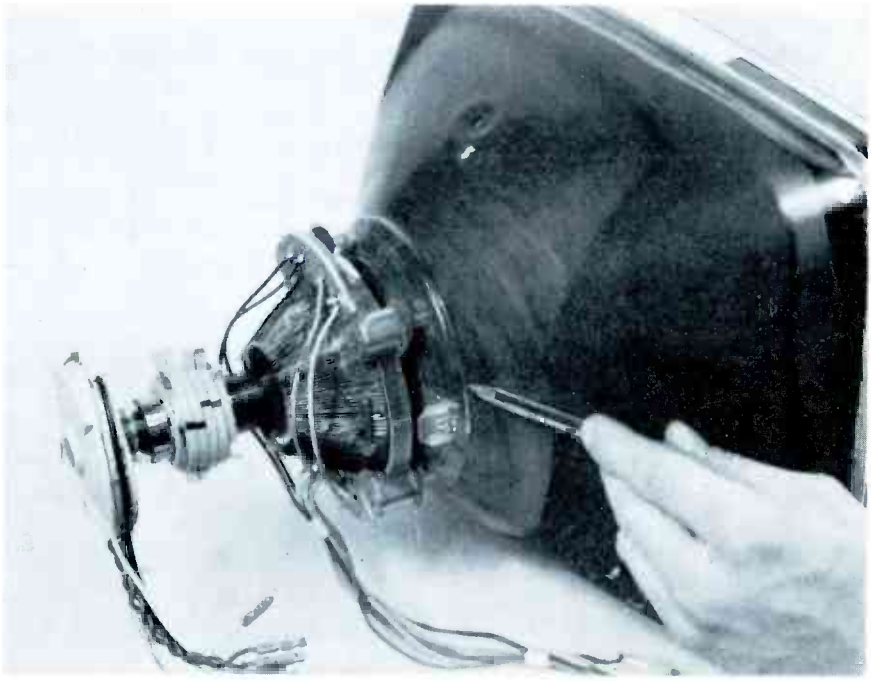


FIGURE 3. A BONDED-YOKE PICTURE TUBE. THE AREA INDICATED IS GLUED TO THE TUBE.

match up the glue marks and reglue it in exactly the same position that it was in before. If that doesn't work, we'll have to replace the picture tube." Many fingers were crossed as Jerry went to work.

He used two kinds of glue. One was an epoxy resin that will hold anything to anything. The other was a contact cement. The contact cement holds the yoke in place until the epoxy dries.

Well, Jerry got it right and the set looked very good. Since everyone was smiling, I took this opportunity to leave. I looked back through the French doors to see Jerry using his hands in gestures as he explained something to the customer. It occurred to me that people who are good with their hands must also use them a lot when they are speaking.

wanted:

NRI graduate is seeking a copy of the NRI Service Manual, Volume 2, containing radio diagrams. Please contact Paul R. Bateman, 711 S. Phoenix, Tulsa, Oklahoma 74127.

Ham News

Ted Beach K4MKX

Several people have written to me about my blunder in the last issue of the *NRI Journal*. In case you missed it, it was simply about the proposed NRI net meeting January 16, 1979 on a frequency of 28.060 MHz. All this after several lines about not wanting to exclude the Novices and Technicians! Of course, everyone is aware that Novice and Tech privileges extend from 28.100 MHz to 28.200 MHz in the 10-meter band, and it was strictly a case of reading over the same error twice that it got by me. For those of you who phoned me, and for the several persons to whom I have written, the way out of the dilemma was to be that we would start out on 28.060 MHz as published, then encourage everyone to QSY up to 28.160 MHz. Since it is still December as I write this, I cannot say how everything will work out, but I'll hope for the best. There will be a fuller report in the next issue of the *Journal*.

For another report of things in the last *Journal*, I would like to say that I have received about ten entries in the QSL design minicontest so far, and would urge everyone to submit their ideas for a card design. We don't want (or need) anything fancy – just a plain old "nuts and bolts" type card that will be able to carry the NRI identity to the amateur fraternity. We would like to make the card one-sided if possible, using two-color printing. Name, address, and call in one color with "basic" information printed in a second color. Send us your ideas before the last day in March, 1979 and you might win the first hundred QSL cards off the press as well as a paid one-year membership in the NRI Alumni Association. Don't be bashful; I *know* there are more than ten of you out there with ideas for a neat QSL card! Let us hear from you.

As a reminder, I urge all of you to read and note the special Rule Changes box which accompanies the Ham News

column. As the FCC makes its various changes to the Amateur Rules, we try to make note of them and print them here for your use. As you may know, Part 97 is now issued only in booklet form and only once a year (in March). Even though the booklet is dated March, it is usually a couple of months after that that it is printed and available to us. Anyway, keep an eye out for the Rule Changes in the box, and be sure to get your copy of Part 97 every year so you won't get in trouble with Uncle Sam!

I read recently that there have been some back-room conferences going on that will probably adversely affect the recommendations the US representatives to 1979 WARC will make regarding amateur frequencies. Apparently broadcasters want the lower end of 160 meters, and the 220 MHz band is being eyed by radionavigation people. Both factions are quite powerful and will very likely prevail, and we will suffer frequency losses in these bands. All is not gloomy, however, as there are definite signs that we will probably ask for additional frequency allocations in the 10 MHz band. *QST* and *Ham Radio* magazines have quite good writeups on these and other activities concerning WARC 1979, and I suggest you read them over yourself to see how we might fare.

Now let's see who we have heard from since last time. As usual, those listed first in the list are students and graduates of NRI's amateur radio courses, while those listed last are from the ranks of other NRI programs.

Gene, K3JFV, writes that after 20 years as a Ham he finally upgraded to Advanced. He says that his code speed is progressing nicely and that he wants to try for Extra real soon. He has only one problem – he has trouble writing fast enough to copy 20 WPM. Well, Gene, with the new comprehensive test for cw you don't really have to write down all that is sent. You might try taking notes (as some people I know have done) since it is an objective, multiple choice examination based on the *content* of the text sent. As to whether you should keep your old call or get a new one, that is up to you. Since you have a one-by-three call, I would be inclined to hang on to it. I fully intend to keep mine when and if I go for Extra. Anyway, good luck, and go ahead and *try* the Extra – it doesn't cost anything these days but some time. Who knows, you might surprise yourself!

KA4EIG sent us a very nice color photo of a sunrise on the Atlantic ocean, taken from the boat on which he lives. Andy retired at age 66 to enjoy Ham Radio and live on a boat. Sounds nice. Presently he is not on the air as he is just about to start building a Heath SB104A. Then, with a little study and practice, he plans to try for the General Class license in Miami. Best of luck, Andy.

WA4ZAU writes from Conyers, Ga., that he is a graduate of our amateur course, but that he does not have the time to devote to amateur radio that he would like. Also, Jim would like very much to find someone who would like to sell (or barter) a Heath DX60A transmitter. If you'd like to deal, write Jim at:

WA4ZAU, Jim Braddy
640 Corly Rd. N.W.
Conyers, GA 30207

KA5BUX sent us an entry for the QSL minicontest (as did several others) which looks quite attractive. Conrad read with interest about a fellow ham's old Multi-Elmac transmitter and says he has the same rig along with the PMR-8 mobile receiver. He also wondered if the company is still in business. Alas, no, Conrad. They folded a number of years ago, like so many of the original

American manufacturers of amateur equipment.

WB7QVI wrote to tell us of his recent upgrade to Technician, and to chide us for writing his call down wrong (as WB7QUI). Sorry about that, Allan, sometimes my typewriter just can't seem to put the right letters down on the paper!

AL7A is another recent upgrade, to the elite Extra ranks. Lee graduated some years ago when he held the call KL7IAC. He says he was ready when he graduated to get the Extra, but somehow or other just couldn't get his code speed up. Lots of on-the-air practice with cw finally did it, though, and he passed with flying colors. Congratulations, Lee.

Not mentioned in the list of NRI amateur course students and graduates is Maurice Beavers who has not yet gotten a license. He has taken the code test for the Novice license, and is waiting to receive the written test papers from Gettysburg. At any rate, he says he would like to participate in the proposed net, but surely won't have his ticket by January 16 so he will just have to eavesdrop this time.

Two others, John McKeown and Christopher Snyder, also do not yet have licenses, but did send in entries for the QSL minicontest. We certainly appreciate the input, fellows, and good luck on getting a ticket and in the contest!

In looking over the list starting with W1TXS, I noticed something that we have not had in quite some time: each of the ten call districts in the continental United States is represented, Ø through 9. In addition, we have one of the two most recent states (Alaska) represented. No big deal, but interesting nevertheless.

W1TXS has had his call for some thirty years. I guess this must qualify Dick as an Old Timer as far as amateur radio is concerned. He says he was in seventh heaven during his military duty when the MARS operator at Camp Gordon gave him the keys to the MARS shack as well as the communications

1	Conditional Class License eliminated. Novice power limit upped to 250 W.	June 25, 1976
2	Technicians given Novice privileges.	July 23, 1976
3	No new distinctive Novice call signs, although Novices may sign "/N."	October 1, 1976
4	No requirement to sign "portable" or "mobile" except foreign operators using reciprocal licenses.	November 26, 1976
5	First "comprehensive" cw exam given in Washington, D.C. office. No solid copy for one minute requirement.	January 1, 1977
6	Court case "temporarily" suspends all license fees.	January 1, 1977
7	New interim licenses issued upon upgrade of license class at an FCC office.	March 1, 1977
8	Secondary station licenses eliminated.	March 3, 1977
9	97.95(a)(2) deleted. no notification of new address required.	March 9, 1977
10	New emission purity standards. All spurious emissions down 40 db for transmitters operating below 30 MHz, down 60 db for transmitters of 25 watts or more operating between 30 MHz and 235 MHz (97.73).	April 15, 1977
11	Code sending test deleted from Commission-administered examinations.	August 26, 1977
12	97.95(b)(2) rescinded. Maritime Mobile in Region 2 may use all amateur frequencies. In foreign waters may use only frequencies authorized by regional government.	September 12, 1977
13	Call sign restructure making special calls available to various class license holders.	March 24, 1978
14	Ban on commercial 10-meter linear amplifiers.	April 28, 1978
15	Novice license term extended to five years, renewable. Technicians given full privileges above 50 MHz.	May 15, 1978

trailer with all that neat equipment and antennas. Like, wow! Even though the gear was mostly AM, Dick says he learned to appreciate good equipment, and has done a bit of searching to make sure the equipment he uses now is of the finest quality. This usually means buying nonworking gear and getting it into condition since he cannot afford most of that exotic equipment. In addition to amateur radio, Dick enjoys fishing, often takes along his two-meter rig to pass the time. Sure sounds like fun, Dick, and I only wish that I had the time to do the same.

WA1WPR and N3AJV also submitted designs for the QSL minicontest, and Randy also mentioned that he was enjoying very much the Model 452 transceiver he built as a part of the Communications course. Always glad to hear those nice words, fellows.

AB3F was formerly WB3HXI, and says that he advanced from CBer to Extra in one year's time. Fantastic! Bob says that he plans to join in the net in January and wants everyone to know that learning the code need not be a trial for those who think they can't learn it. He says the real key is *desire* and *willpower*. To that must be added *practice*, but Bob's pursuit of his goal (the Extra license) is testimony to his learning philosophy. In his letter, he also brought out a point I have always been in favor of. That is, sheer rf power is not always the answer for success on the amateur bands. Bob ran 2 kW PEP for some time, and says he has had as much success using a Heath SB104A barefoot with good antennas as he had when running full legal power. In one year of operating with the Heath transceiver, there were only one or two contacts he could *not* make due to not having enough power. My position exactly, Bob. Maybe for contests it helps to have a loud voice, but for most work 100 to 200 watts is plenty and makes hamming interesting and fun. Hope to hear you January 16.

WA3WZF is another amateur who is also interested in microcomputers. Jerry has a Central Data computer which uses a 2650 (Signetics) microprocessor. Jerry got interested in computers because of his interest in RTTY, knowing about all the neat things one could do with a computer coupled to a RTTY station. He is very active in RTTY, and invites anyone who is interested to join in on the 2650 RTTY Net which meets Thursdays at 2330Z on 3993 kHz.

KA4EMU writes that he is planning to try for the Technician license so that he will be able to use the Model 452 transceiver when he gets to it in his course. Ronald says that the NRI training has helped him tremendously with the theory portion of the examinations. His low-band station consists of a Heath SB104, SB604 speaker, and HD1410 keyer along with a surplus military straight key. He has dipoles for 40 and 80 meters and is planning to build a tri-band quad for 10-15-20. Sounds very worthwhile, Ronald, and I sure wish I had the room for such antennas.

The last time KD4F appeared in these pages was in the last issue. However, at that time he was WD4PIQ and had just passed his Extra exam but had not gotten a new call. Dan also says that he got the Second Class Radiotelephone license at the same time, and just barely missed First Class, which he will take again in the near future. Congratulations all around, Dan.

I had a nice phone conversation with Dick, W40XY, the other day. He was calling with regard to a couple of problems he was experiencing with his Model 452 transceiver. Dick was very happy with the performance of the rig, and thought it was an excellent design. However, he did have some parts problems, which we have cor-

Gene	K3JFV	A*	Media PA	Dan	KD4F	E*	Mayport FL
Andy	KA4EIG	N	Tavernier FL	Dick	W40XY	–	Panama City FL
Margaret	WA4FTJ	E*	Virginia Beach VA	David	KD4R	E*	Lithonia GA
Jim	WA4ZAU	–	Conyers GA	Merlin	WD5CGS	G*	Duncan OK
Conrad	KA5BUX	T*	Tryon OK	Terry	WB5LKN	–	DeRidder LA
Allan	WB7QVI	T*	Eugene OR	John	K6AUZ	T	San Bernardino CA
Mark	KA9CJC	N	Fairbury IL	Louis	N6AND	T	Napa CA
Ed	WD9JFE	N	Joliet IL	Glen	N6ARM	T	Sherman Oaks CA
Lee	AL7A	E*	Anchorage AK	John	WB6CKN	E*	Gonzales CA
				Sherry	WD6ERX	G	Modesto CA
Dick	W1TXS	–	Springfield MA	Bill	KA7CKU	N	Mountain Home ID
Rick	WA1WPR	–	Berwick ME	Mike	WD8BKE	–	Ypsilanti MI
David	N2ALF	T	Cherry Hill NJ	Don	WB8STQ	–	Trotwood OH
George	KA2ATD	N	Wayne NJ	David	KA9CBI	A*	Kankakee IL
Randy	N3AJV	–	Derry PA	Bill	W9DJI	–	Chicago IL
Bob	AB3F	E*	Pasadena MD	Richard	NØAHW	T	Dubuque IA
Jerry	WA3WZF	G	Ft. Meade MD	Vern	KAØCHS	N	Cedar Rapids IA
Ronald	KA4EMW	N	Galax VA	Jose	WL7ADM	T	Eilson AFB AK

*Just upgraded – congratulations!

rected. Thanks for the call, Dick, it is always a pleasure to hear nice words from satisfied students like yourself.

KD4R is also looking forward to building his Model 452 transceiver. At present, David is using a TS520 and an all-band trap dipole. He plans to check in on the NRI net January 16, and we'll surely be listening for him.

N6AND made a contact with his Model 452 the first time he called CQ. Louis says that he was very pleased and surprised since he was using the wire antenna supplied with the kit and was using low (1 watt) power at the time. Fine business, Louis, and if that contact was direct rather than through a repeater, you can be doubly pleased!

WB6CKN wrote a while ago telling us of his upgrading to Advanced class, and we are certainly pleased to hear of the recent upgrade to Extra. John also passed along the information that he had authored a series in *73* magazine, starting in November 1977 and continuing through May 1978. The series was entitled "FCC Math" and was a tutorial on getting one's mathematics up to speed for taking an FCC examination. I must admit I did not associate John with NRI, but I had glanced over several of the series and thought they were well written (if only the type had been a bit larger!). John says that he, too, is getting interested in the computer and is thinking of all sorts of neat things to use one for when he decides to get fully involved. Right now he is waiting to see what the new NRI microcomputer course has to offer before going ahead with one of the commercial units. By the time you read this, you should already have seen some of the NRI ads for the new course, and hopefully we will have literature available for those of you who write in. Actually, we think it is a pretty good program, and are all quite excited about it.

WD6ERX appears to be a very enthusiastic amateur, having been licensed for about a year. Sherry and her husband (Mark, WD6EPT) both enjoy working the low bands, using a Tempo One, and the high bands, using a Yaesu 227R. So far she has WAS and WAC and needs only a few more contacts for DXCC. On top of all that, her picture was in the October 1978 issue of *QST*. Very nice going, Sherry, and we'll certainly be looking foward to hearing you on the NRI net.

KA7CKU submitted an entry for the QSL minicontest, and also noted our discrepancy in frequency selection (excluding Novices and Technicians). I hope everything works out and we manage the QSY to 28.160 MHz, Bill!

WB8STQ is another author. Don writes that he had an article on page 19 of the November 1978 *QST* which I must admit I had *not* seen until he called it to my attention. In addition, the very attractive card Don sent us was designed by his wife, Jan. It is a striking rendition of the United States in the form of an American Flag. Very nice, Don.

Last (but certainly not least) was a card from Jose, WL7ADM. Regarding the NRI net, he says: ". . . sounds great! But 28.060 MHz is a no-no for Novices and Techs. Anyhow, I'll scan the novice band and QSU on 28.160 MHz with my HW101 and whichever vertical Santa Claus brings me (Hi). 73 and Merry Christmas."

I couldn't have said it better, Jose, and to all of you out there from us here at NRI the very best of Holiday greetings and have a *very* good new year.

Very 73, Ted – K4MKX

Job Op

BROADCAST ENGINEER: Needed to operate and maintain transmitter and studio equipment for WFIN Radio in Findlay, Ohio. Must have First-Class FCC Radiotelephone license. Contact Dennis Rudd, 101½ W. Sandusky Street, Findlay, Ohio 45840.

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Honors Program Awards

For outstanding grades throughout their NRI courses, these August, September, and October graduates were given Certificates of Distinction with their NRI diplomas.

WITH HIGHEST HONORS

Gordon E. Adams, Morrin AB Canada
Osvaldo R. Alvarado, Uthado PR
Tony Archuleta, Petersburg AK
Ralph E. Armentrout, Covington VA
Thomas Beineke, Springfield IL
Glen D. Blaylock, Sebastopol CA
Charles H. Cannon, Mount Laurel NJ
Richard P. Croft, South Lake Tahoe CA
Thomas Delton Davis, Middle Grove NY
Terry J. Dyck, Swift Curr SK Canada
Walter S. Fogg, Flushing NY
Michael N. Franck, Panama City FL
Nancy L. Gates, Jacksonville FL
LeRoy C. Gessel, Port Richey FL
John B. Gillespie, Regina SK Canada
Gregory D. Gordon, Fredericksburg VA
Donald Michael Griner, Leesburg GA
G. Michael Hager, Huntington WV
George A. Hall, Keene NH
B. J. Hartwick, Pensacola FL
George H. Hawkins, Orlando FL
Ronald J. Hogan, Port Aux Basques Canada
Harold L. Joplin, Grandview TX
John Lee Kantzman, Mandan ND
William S. Keller, Yellowstone Nat'l. Park WY
Robert L. Lange, Anchorage AK
R. Wallace Lord, Aspen CO
Allan Malinoski, Saskatoon SK Canada
Robert J. Mathews, Glendale Heights IL
Donald J. Maxa, Westchester IL
William A. McAndrews, Lake Halen FL
Howard Russell McCort, Rock Springs WY
Edwin Meyers, Metlakatla AK
Stephen A. Nemeth, Alexandria VA
Hugh Michael O'Brien, FPO San Francisco
Gregory L. O'Connell, Manitowoc WI
Zdenek R. Ondracek, Park Ridge NJ
Wayne N. Parrish, Ionia NY
David Paul Petrus, Youngstown OH
Richard Poff, Martinsville VA
Peter J. Prigione, Estevan SK Canada
Angela Ragona, Phoenix AZ
John J. Reardon, Cincinnati OH
Lester Reiss, Howe ID
Norman M. Rhodes, San Dimas CA
John William Ruder, Hastings MI
Vincent L. Santus, Butler PA
Gerald W. Scully, Hamden CT
Jeffrey Eugene Spaid, Hemet CA
Dennis L. Spencer, Arcola MO
Charles R. Stevens, Saugerties NY
Christian R. Svanberg, Hagersten Sweden
Daniel W. Tanner, Billings MT
Scott Allen Titensor, Thayne WY
Jack B. Travis, Cantonment FL
Yasunbu Uyehara, Pearl City HI
Bob Walker, North Bellmore NY
Edward E. West, High Point NC
Stanley F. Wied, Bedford TX
Tze-Yue Wong, Hamilton ON Canada
Steven R. Yaeger, Samuels ID

WITH HIGH HONORS

Jose S. Abad, Long Island City NY
Frank Albright III, Staten Island NY
Donald L. Allen, Seymour CT
Gary L. Arnold, Grand River IA
Thomas Arne Autio, Cloquet MN
Walter C. Bandy, Pulaski VA
Theodore Burton Banks, Pontiac MI
Joseph N. Barriere, Schertz TX
Richard H. Bartman, Newberry Springs CA
Robert L. Bates, San Diego CA
Ronald J. Baxter, New London CT
Charles N. Bertling, Worthington IA
M. T. Betancourt, Jr., Mobile AL
Willard E. Billington, Ocean Springs MS
John Michael Bishell, Jolon CA
Gary E. Blanken, Silver Spring MD
Cary Lee Blotzer, Penn PA
William I. Borden, Carl Junction MO
Alex Y. Boyce, Romeo MI
Robert M. Bradshaw, Los Angeles CA
Jaime Hale Brady, Supply NC
George B. Brantley, Jr., Cannon AFB NM
Gordon Brocklebank, Kincardine ON Canada
Jack Dale Brookhart, Atlanta GA
Irvin Q. Bruce, Claremont NH
Hugh W. Bruen, Seattle WA
Sharon L. Burchett, East Wenatchee WA
Wayne E. Burgess, Scarborough ON Canada
Darwin Paul Burkholder, Sidney OH
Joseph R. Butchko, Bethlehem PA
Michael David Butler, Laurel MD
Robert Cahill, Truth or Consequences NM
William E. Cantrell, Layton UT
Raymond J. Carlisle, APO New York
John E. Cartwright, Lander WY
Adolph William Caruso, Frisco NC
Jim B. Charles, Columbus OH
William R. Cline, Oxon Hill MD
Harvey W. Compton, Ranger TX
Phillip H. Conway, New Market VA
W. Dale Conway, Jr., Mt. Vernon MO
Eldon L. Coons, Michigan City IN
Thomas P. Corish, York PA
Edward J. Costello, Jersey City NJ
David Lorin Crawford, Columbia City IN
Barry Edwin Dahlin, Middlebury VT
Charles H. Dangerfield, Charleston SC
Cecil Davis, Echols KY
James Andrew Davis, Comanche TX
Jo-Lynn Davis, New Brunswick NJ
Thomas J. Dawkins, Jr., Maud TX
John Edgar Dawson, Bellevue NE
William D. Decker, Monroeville AL
Mark Wavell De Groot, Presho SD
William E. Dingley, Jr., Panama City FL
Sam E. Donegan, Birmingham AL
Paul David Donlin, Dallas PA
William F. Doyle, Leominster MA
Michael A. Duffy, FPO New York
James D. Duval, Seabrook TX
Joseph Eby, Brewton AL
Michael Russell Eck, Coopersburg PA
Eric Calvin Edsman, Jr., Kailua-Kona HI
Wesley J. Egleberger, Kingston PA
William M. English, Sumter SC
Clarence H. Farber III, Summerville SC
Vernon Fierre, Monrovia CA
Steve File, Milwaukee WI
Eugene F. Fleming, Colorado Springs CO
Dee Friesner, Meadville MO
Billy R. Frye, Minden LA
James N. Gaudette, Ovid NY
Robert S. Gay, Garfield GA
Kenneth Geehern, Monroe NY
Charlie C. Gentry, Huntingburg IN
Rex Randolph Ginn, Howe ID
Lloyd Goodson, Tishomingo OK
Grafton Griffith, Forest Park GA
Raymond E. Gunderson, APO New York
Andrew N. Hall, Barrington RI
Lawrence B. Hall, Lyndon KS
Chuck Hamerin, Carmel IN
Robert John Harding, St. Paul MN
Charles A. Harper, Ozark MO
William Owen Harper, Rogers AR
Don A. Harrold, New Holland PA
Rondale E. Hartman, Vale NC
Mark Allan Haughton, Little Falls NY
Walter E. Hedman, Acampo CA
Larry Anton Helmer, Chicopee MA
Michael R. Hemmert, Toledo OH
Timothy A. Henry, Roswell NM
Allan Ray Hills, Salem OR
Ralph H. Holden, Altus OK
Ronald Holle, Littleton CO
Charles L. Howell, Suffolk VA
Daryl J. Huebner, Manitowoc WI
Terry Lee Husted, Wellsburg NY
Theodore Hyl, Hollis NY
Donald C. Jacobsen, Grand Prairie TX
Michael Chester Jarvis, Greencastle IN
Phyllis A. Jennison, Greene NY
Albert C. Jewell, Las Vegas NV
Melvin L. Johnson, Oxford PA
Oyd Johnson, Mize MS
Zane A. Johnston, Midland MI
Richard E. Kadets, Ft. Bragg NC
Roman C. Kamola, Webster NY
Richard F. Kenstad, Massapequa NY
Merlin E. Keown, Dallas TX
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James P. Keyvy, FPO San Francisco
Mohammad Ayub Khan, Santa Clara CA
Robert M. Kidder, Ayer MA
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Charles Wayne King, St. Charles MO
Richard Arthur King, Oak Ridge TN
David R. Kinney, Phoenixville PA
Larry Ralph Kinsman, Whiteman AFB MO
Keith Kirby, Silverdale WA
Don Kjellerson, Kansas City MO
Richard C. Knightly, West Mount Vernon ME
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Patrick A. Merricle, Wapakoneta OH
Serge Millen, Bellville ON Canada
Basil L. Miller, Friendswood TX
Raymond A. Miller, Burgettstown PA
William Millett, Jr., Belmont MA
Charles M. Milliron, Akron OH
Lloyd Edward Mintzmyer, Kearney NE
Dane Harvey Miracle, New Tazewell TN
Richard Allen Moe, Star Prairie WI
Arthur Mohr, Sheboygan WI
Robert E. Monical, Hereford TX
Ronald Monkel, Fort Lauderdale FL
Harold J. Morse, Blakeslee PA
Steven F. Nagy, Fort Belvoir VA
Jack Malcolm Nelson, Pemberville OH
George Nichola, Livonia MI
Wayne Nichols, Fayette AL
Jeffrey N. Nowc, Albany NY
Thomas F. O'Connor, Glen Ellyn IL
David E. Ohl, Salem OH
James M. Owen, Keller TX
Theodore Francis Paquin, Worcester MA
Larry Steven Parker, FPO New York
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Rudolph J. Plesha, Highland IN
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Heung Lam Poon, Oakland CA
Ronald M. Price, Charleston WV
Lewis E. Prine, Saint Paris OH
William Raby, Villa Grove CO
Charles Rambo, Gilmer TX
Gregory P. Ramos, Jolon CA
William J. Ratelle, Southfield MI
John S. Rectenwald, Topsham ME
Curtis Rennie, Calgary AB Canada
Hector Luis Rivera, Sauk Village IL
Paul E. Roach, Roseville MN
Tim D. Rogers, Missouri City TX
Chester W. Russell, Marietta OH
Donald F. Sage, Denville NJ
Margarito Galan Santos, San Diego CA
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Alumni News

Harry Taylor

PITTSBURGH CHAPTER

Jack Benoit, one of our board members, brought an RCA portable TV that needed work to one of our recent service meetings. The picture on this set would roll vertically when the brightness control was varied. Under the guidance of Chairman George McElwain, we traced the trouble to the high-voltage hold-down circuit. We found that the supply voltage to the vertical oscillator was affected by changes in the current drawn from the high-voltage circuit. This was affected by the brightness. Because the oscillator is sensitive to supply voltage changes, it lost synchronization with the transmitted TV signal and the picture rolled.

We invite other NRI graduates to our meetings. If you are interested in gaining practical experience, get in touch with us and come to our meetings.

DETROIT CHAPTER

The most recent meeting was led by Chairman Jim Kelley. We kept the regular business short so we could see and hear what Harry Taylor had brought us from Washington.

We really enjoyed Harry's slide show concerning NRI, especially the slides about the packaging and shipping operations. Some of our members had visited NRI at their headquarters on Wisconsin

Avenue and found many of the scenes on the slides familiar. We would all like to tour the school whenever we get to Washington.

Harry showed us the new solid-state resistance-capacitance checker, rf-af signal generator, and signal tracer offered by the CONAR Division of NRI. We critiqued each of these instruments. In general, we liked the digital readout of the operating frequency of the signal generator. This simplifies the setup of the instrument. The level meter on the signal tracer was also considered to be very useful.

FLINT/SAGINAW VALLEY CHAPTER

We have had a number of meetings since the last report in the Journal. Harry Taylor visited and spoke at one of our meetings in November. At that meeting, we also serviced a GE portable color TV with horizontal drifting and a picture that was shifted to the left. After much troubleshooting, we sought help from the GE representative. He advised us to install a modification recommended by GE. The modification, plus a little ingenuity, corrected the trouble.

At a more recent meeting, we solved two TV problems by inspection. One was a Zenith 12A12C5 chassis with arc-over on a terminal board. The other, an RCA 15CTC chassis, had poor circuit board ground connections. The poor grounds were due to rosin in the solder joints. Apparently, the joints were not heated sufficiently during assembly. Therefore, the rosin flux was not boiled away and a thin layer of rosin remained between the terminal lug and the copper on the circuit board. Applying heat boiled the rosin away and improved the grounds.

Harry discussed new developments at NRI and the changes in the field of TV

DIRECTORY OF ALUMNI CHAPTERS

DETROIT CHAPTER meets at 8 p.m. on the second Friday of each month at St. Andrews Hall, 431 E. Congress Street, Detroit. Chairman: James Kelley, 1140 Livernois, Detroit, Michigan. 841-4972.

FLINT (SAGINAW VALLEY) CHAPTER meets 7:30 p.m. the second Wednesday of each month at Andy's Radio and TV Shop, G-5507 S. Saginaw Road, Flint. Chairman: Dale Keys. Phone (313) 639-6688. Shop phone (313) 694-6773.

NEW YORK CITY CHAPTER meets at 8:30 p.m. the first Thursday of each month at 1669 45th Street, Brooklyn, N.Y. Chairman: Sam Antman, 1669 45th Street, Brooklyn, New York.

NORTH JERSEY CHAPTER meets at 8 p.m. on the second Friday of each month at the Players Club, located on Washington Square in Kearny, New Jersey. Chairman: Al Mould. Telephone 991-9299 or 438-5911.

PHILADELPHIA-CAMDEN CHAPTER meets on the fourth Monday of each month at 8 p.m. at the home of Chairman Boyd A. Bingaman, 426 Crotzer Avenue, Folcroft, Pa. Telephone 583-7165.

PITTSBURGH CHAPTER meets at 8 p.m. on the first Thursday of each month in the basement of the U.P. Church of Verona, Pa., corner of South Avenue and Second Street. Chairman: George McElwain, 100 Glenfield Dr., Pittsburgh, Pa. 15235.

SAN ANTONIO (ALAMO) CHAPTER meets at 7 p.m. on the fourth Thursday of each month at the Alamo Heights Christian Church Scout House, 350 Primrose St., 6500 block of N. New Braunfels St. (three blocks north of Austin Hwy.), San Antonio. Chairman: Robert Bonge, 222 Amador Lane, San Antonio. All San Antonio area NRI students are always welcome. A free annual chapter membership will be given to all NRI graduates attending within three months of their graduation.

SOUTHEASTERN MASSACHUSETTS CHAPTER meets at 8 p.m. on the last Wednesday of each month at the home of Chairman Daniel DeJesus, 12 Brookview Street, Fairhaven, Mass. 02719.

SPRINGFIELD (MASS.) CHAPTER meets at 7:30 p.m. on the second Saturday of each month at the shop of Norman Charest, 74 Redfern Drive, Springfield, Mass. 01109. Telephone (413) 734-2609.

TORONTO CHAPTER meets at McGraw-Hill CEC, 330 Progress Ave., Scarborough, Ontario. For information contact Stewart J. Kenmuir, (416) 293-1911.

servicing. He predicted that there would be more than 400,000 video cassette recorders sold during the year and he felt that TV service technicians should qualify to service them.

NEW YORK CITY CHAPTER

We had a very interesting meeting in December. We began with a discussion of vom's and vtvm's. In performing tests on radio and TV equipment, we found that the vom's indicate an ac voltage even when there is no ac present in the circuit under test. We located schematic diagrams of two separate brands of vom's and found that when the probes are plugged into the normal "COM" and "VOM" jacks on the vom, there is no dc blocking capacitor in the circuit. Therefore, if there is an ac voltage, a dc voltage, or a combination of the two, the vom will indicate a voltage when it is switched to the "AC VOLTS" position.

Harry Taylor, here for his annual visit, discussed NRI, two new CONAR test instruments, and video cassette recorders. The discussion that followed centered around problems some of the members had experienced in communicating with NRI. Harry agreed to act on these problems.

SOUTHEASTERN MASSACHUSETTS CHAPTER

The focus of our October meeting was video cassette recorders. Harry Taylor gave a short talk on the principles of operation of the RCA VTB200 when he visited our Chapter. This machine is very similar to the Sylvania machine that we had on hand. Dan DeJesus, our chairman, had recorded a TV program, which he played back through a new Sylvania TV. We were pleasantly surprised at the quality of the program. There was no apparent degradation of the picture quality. The picture was as good as you would expect from an off-the-air signal.

Of special interest to the members was the manner in which the TV information is recorded on the tape – the audio, video, and sync signals are recorded separately, with the video in diagonal bands and the audio and sync signals recorded longitudinally at the top and bottom edges of the tape. On playback, the sync signal on the tape controls the motion of the tape as well as the sweep circuits of the TV set.

PHILADELPHIA/CAMDEN CHAPTER

The November meeting was led by Chairman Boyd Bingaman. Harry Taylor visited and showed slides of the NRI facilities and personnel. He also showed several pieces of new test equipment for radio and TV servicing. We were interested in the construction, as well as the performance, of these instruments.

We discussed the more recent developments in the fields of TV servicing and microcomputers. Stanley Feurman, who is a computer buff, outlined his system and the modifications he has planned for the near future. There was also interest expressed in the new microcomputer course that is being developed by NRI.

NORTH JERSEY CHAPTER

The North Jersey Chapter has presented a plaque to Tom Nolan, the former Alumni Executive Secretary. We did this to show our appreciation for his help and friendship over the nine years that Tom served as Executive Secretary. We did not get an opportunity to present the plaque in person, so we sent it to NRI, where the presentation was made.

Statement of Ownership, Management and Circulation (Act of August 12, 1970; Section 3685, Title 39, United States Code). 1. Title of publication: NRI Journal. 2. Date of filing: September 30, 1978. 3. Frequency of issue: Quarterly. 3A. Number of issues published annually: Four. 3B. Annual subscription price: $2. 4 and 5. Location of known office of publication, headquarters or general business offices of the publisher: 3939 Wisconsin Avenue, Washington, D.C. 20016. 6. Name and address of the publisher: William F. Dunn, 8802 Fox Hills Trail, Potomac, Md. 20854. Name and address of the editor: Same. Name and address of the managing editor: Thomas H. Beadling, 1650 Harvard Street, Washington, D.C. 20009. 7. Owner: National Radio Institute, 3939 Wisconsin Avenue, Washington, D.C. 20016. 8. Known bondholders, mortgagees, and other security holders owning or holding one percent or more of total amount of bonds, mortgages, or other securities: McGraw-Hill, Inc., 1221 Avenue of the Americas, New York, N.Y. 10020. 9. For completion by nonprofit organizations authorized to mail at special rates (Section 132, 122, Postal Manual: Not applicable. 10A. Total no. copies printed (net press run): Average no. copies each issue during preceding 12 months: 93,697. Actual no. of copies of single issue published nearest to filing date: 96,600. 10B. Paid circulation: 1. Sales through dealers and carriers, street vendors and counter sales: Average no. copies each issue during preceding 12 months: None. Actual no. copies of single issue published nearest to filing date: None. 2. Mail subscriptions: Average no. copies each issue during preceding 12 months: 86,773. Actual no. copies of single issue published nearest to filing date: 95,130. 10C. Total paid circulation: Average no. copies each issue during preceding 12 months: 86,773. Actual no. copies of single issue published nearest to filing date: 95,130. 10D. Free distribution by mail, carrier or other means including samples, complimentary, and other free copies: Average no. copies each issue during preceding 12 months: 500. Actual no. copies of single issue published nearest to filing date: 500. 10E. Total distribution (sum of C and D): Average no. copies each issue during preceding 12 months: 87,273. Actual no. copies of single issue published nearest to filing date: 95,630. 10F. 1. Office use, leftover, unaccounted, spoiled after printing: Average no. copies each issue during preceding 12 months: 6424. Actual no. copies of single issue published nearest to filing date: 970. 2. Returns from news agents: Average no. copies each issue during preceding 12 months: None. Actual no. copies of single issue published nearest to filing date: None. 10G. Total: Average no. copies each issue during preceding 12 months: 93,697. Actual no. copies of single issue published nearest to filing date: 96,600. 11. I certify that the statements made by me above are correct and complete. (signed) William F. Dunn, Publisher. 12. For completion by publishers mailing at the regular rates: Permission requested.

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SELECT YOUR TERMS TO FIT YOUR BUDGET

CONAR FINANCIAL RATES

The Finance Charge on balances up to $500 is 1½% per month. On any portion of a balance over $500, the rate is 1% per month. This is an Annual Rate of 18% and 12% respectively. The Finance Charge is computed on the month end balance of your billing cycle. You will receive a statement each month approximately 10 days before your payment is due. It will give you the current balance, finance charge, list payments made during billing cycle, date your payment is due, and amount of minimum payment due.

HOW TO DETERMINE THE AMOUNT OF YOUR MONTHLY PAYMENT

The minimum monthly payment on a Conar account is 7% of the original unpaid balance or $5, whichever is greater. The 7% is calculated to the nearest dollar. For example, if your original balance is $140, your payment would be $10. If your original balance is $160, your payment would be $11.

And remember—every purchase carries the Conar Guarantee—"the best in the industry."

TO SPEED SHIPMENT

1. Complete other side of this sheet.
2. Insert amount of down payment (at least 10% of total order) and other information in Payment Agreement on other side.
3. Sign Payment Agreement and fill in Credit Application.

IMPORTANT: Additional purchases—Once your credit is established and you have made at least three payments on your account, you can "add on" to your account with purchases of $20 or more. No down payment is required for add-ons of less than $100. If you are under 21, please have the Payment Agreement and credit application filled out and signed by a person over 21. He can make the purchase for you and will be responsible for payment. If you have a Conar account open or recently paid in full, just sign the Payment Agreement.

NOTICE TO THE BUYER: (1) Do not sign this agreement before you read it or if it contains any blank space. (2) You are entitled to a copy of this agreement.

IT'S AS EASY AS A - B - C TO OPEN A CONAR ACCOUNT

PLEASE ALLOW ADEQUATE TIME FOR NORMAL ROUTINE CREDIT CHECK. ONCE YOUR CREDIT IS ESTABLISHED, ONLY YOUR SIGNATURE IS NEEDED TO ADD ON PURCHASES.

WHERE DO YOU LIVE?

A ➔

Print full name _____ Age _____

Home address _____ City _____ State _____ Zip code _____

Home Phone _____ How long at this address? _____ ( ) Own home ( ) Rent

Rent or mortgage payments $ _____ per month ( ) Married ( ) Single Wife's name _____

No. dependent children _____ Previous address _____ How long? _____

WHERE DO YOU WORK?

B ➔

Your employer _____ Monthly income $ _____

Employer's address _____

How many years on present job? _____ Position _____

Previous employer _____

Wife's employer _____ Monthly income $ _____

WHERE DO YOU TRADE?

C ➔

Bank account with _____ ( ) Checking ( ) Savings ( ) Loan

Address _____

Credit account with _____ Address _____

Credit account with _____ Address _____

Total of all monthly payments including car $ _____

The Elenco Precision Model 1200. The Superb Digital Multimeter. New from CONAR.

The Elenco Precision Model M1200 multimeter is a significant contribution to the instrumentation field.

High performance has been engineered into this instrument to make available to engineers, technicians, service personnel and training institutions a digital multimeter that is reasonably priced yet exceeds the performance of most meters.

The basic instrument is designed for maximum reliability, simplicity of operation and minimum error in reading.

The 1200 offers resolution on ohms ten times greater than most DMMs. This allows you to detect shorted windings in coils, transformers or motors. It is also useful in checking low contact resistance in switches, relays or connectors. Its Hi-Lo Power ohms feature permits measurement of resistors in a circuit.

The 1200 design is based on a custom LSI IC using a dual slope converter technique.

This approach provides inherent accuracy of better than 0.05 percent in the basic design. Precision resistors typically better than 1 percent are used in the voltage dividers preceding the IC.

Specifications:

DC VOLTS: Range: 200 mV, 2 V, 20 V, 200 V, 1000 V. **Accuracy:** 1 percent plus or minus one digit. **Resolution:** 0.1 mV. **Overload protection:** 1000 V maximum. **AC VOLTS: Range:** 200 mV, 2 V, 20 V, 200 V, 1000 V. **Accuracy:** 1.5 percent plus or minus two digits. **Resolution:** 0.1 mV. **Overload protection:** 1000 V maximum, 200 mV scale 600 V. **DC CURRENT: Range:** 2 mA, 20 mA, 200 mA, 2 A. **Accuracy:** 1 percent plus or minus one digit. **Resolution:** 1 microampere. **Overload protection:** 2-ampere fuse and diodes. **AC CURRENT: Range:** 2 mA, 20 mA, 200 mA, 2 A. **Accuracy:** 1.5 percent plus or minus two digits. **Resolution:** 1 microampere. **Overload protection:** 2-ampere fuse and diodes. **RESISTANCE: Range:** 20, 200, 2K, 200K, 2 megohms, 20 megohms. **Accuracy:** 1 percent plus or minus one digit. **Resolution:** 0.01 ohm. **ENVIRONMENTAL: Temperature coefficient:** 0 to 30 degrees Centigrade plus or minus 0.025 percent per degree Centigrade. **Operating temperature:** 0 to 50 degrees Centigrade. **Storage:** –20 degrees to 60 degrees Centigrade. **GENERAL: Power:** 105-130 V, 60 Hz. **Size:** 8¼ by 5¾ by 2¼. **Weight:** 2½ pounds.

Features:

Large digits one-half inch high for easy reading / High input impedance: 10 megohms / High accuracy is achieved with precision resistors, not with unstable trim pots / Input overload protection / Auto zeroing and automatic polarity / AC line operation / Low ohm scale reads as low as 0.01 ohm / Overrange indication / Hi-Lo Power ohms: low for resistors in a circuit, high for diodes.

Warranty:

All Elenco models are guaranteed for two full years on all parts and service. For the first three months you get full coverage at absolutely no charge. For the remaining 21 months a nominal service charge ($15) is required to cover mailing and handling.

Only $79.95

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