



- Short-Circuiting Those CB Thieves
- The Ear Doctor:  
CB Servicing Case Histories



# journal

March/April 1977

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**RECEIVER SECTION:** The Fanfare 100 is designed to transmit AM signals in the 26.965-to-27.255-MHz Citizens Band. Highly sensitive and selective dual-conversion superheterodyne-type circuitry. Full 23-channel crystal-controlled operation is provided by a frequency-synthesized circuit consisting of 12 crystals. The receive section includes an S/R/F meter for reading signal/power strength, an adjustable squelch control to eliminate background noise when no signal is being received, and an automatic noise limiter to suppress atmospheric and manmade interference.

**TRANSMITTER SECTION:** The transmitter is designed to transmit AM signals in the 26.965-to-27.255-MHz Citizens Band. The crystal synthesized circuit used in the receiver section is common to the transmitter, and provides full 23-channel crystal-controlled operation. One hundred percent modulation capability and up to 5 watts power input to the final RF stage.



# journal

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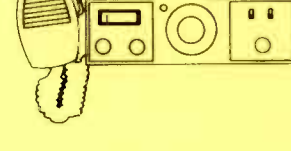
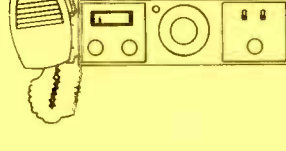
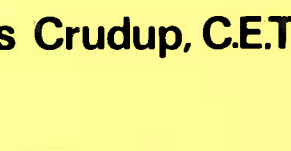
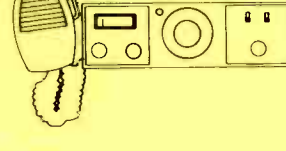
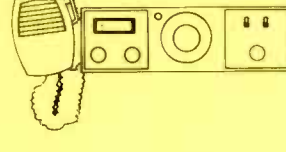
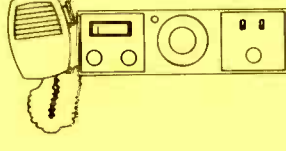
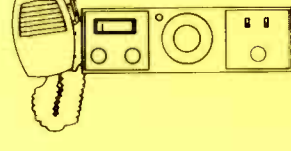
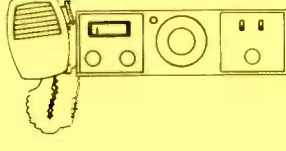
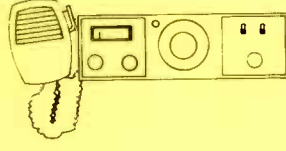
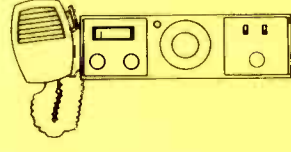
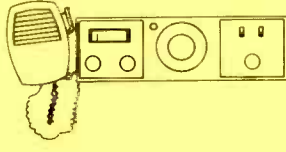
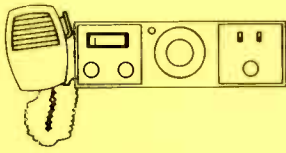
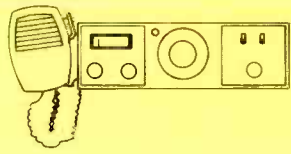
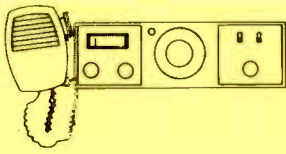
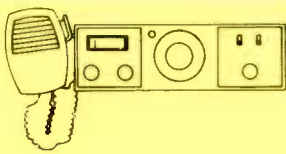
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In this issue, irrepressible NRI development engineer James Crudup tells us how to thiefproof our CB transceivers, NRI grad Harold Kinley gives us some insight into practical on-the-bench problems in his burgeoning part-time CB servicing business, and J. B. Straughn, NRI's grand old man of TV servicing, adds another chapter to his ever-popular collection of TV servicing case histories.

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# Short-Circuiting Those CB Thieves

by James Crudup, C.E.T.

Did you know that the average street life of a CB radio in the United States is 25 days and that one out of every three CB radios is stolen? CB radios are easy items for thieves to unload and it seems that they are just as easy to steal. Two police officers, staked out in a shopping center in Miami, timed what must have been a professional CB thief. It took him exactly 37 seconds once he had entered a car to get out with the CB radio. Of course, they apprehended him. These statistics probably don't shock you if you have been a victim of the CB rip-off. However, if you are one of the lucky few that have been able to retain their radio without taking any special precautions the odds are, your luck is bound to run out.

CB radios installed in cars aren't the only prey of the CB thief. A Radio Shack store in the Washington area was vandalized recently. The thieves backed up to the front of the store with a truck, removed the entire front window, and drove away with a truckload of CB radios. If you think that's bold, what about this one? A few months ago a thief or thieves (they often work in pairs) removed my father's CB radio from his car which was parked in front of the house. And would you believe the next night they came back and got the antenna? Had my father taken a few of the precautions that I am about to offer, I am sure he would still have his radio or at least his antenna.

## MARK YOUR RADIO

The recovery rate for stolen CB radios is very low. This is mainly because they are in demand and are easy to sell. Thieves can unload them quickly. However, a few radios are recovered by the police. But, if you cannot identify your

radio, the police will not return it to you. When you go to a police station to claim your radio, you have to know more than the brand name and model number. After all, the manufacturer made more than one radio and the police want to be sure they are returning the radio to its rightful owner. One good way to identify your radio is to engrave your drivers license number into the chassis. Be sure to indicate the state. Some thieves move from state to state doing their dirty deeds.

There is a company called Identifax which operates out of New York that has set up a computerized identification system. For a one-time fee of \$9.50, a customer is provided with a stencil with a code number, a computer card, and an engraver. The code numbers are all individual and are engraved on a number of items of value such as CB radios, stereos, tape players, televisions, etc. Then, the computer card is sent back to the computer center for storage. Whenever stolen items with these numbers are recovered by the police, they can be traced to the rightful owner. Special warning stickers are also provided to customers. They can be applied to car windows, doors, etc. This sticker becomes a deterrent because it warns thieves that all items have been marked for easy identification. This makes them more difficult to sell.

## LOCKS FOR CB RADIOS

It has been my contention that locks don't stop professional thieves; they simply slow them up. But, an ounce of prevention is sometimes worth a pound of cure. There are several types of locks available for CB radios.

One type uses a braided steel cable with one end mounted to the dash of the car. the other end, which is equipped

## ALARMS

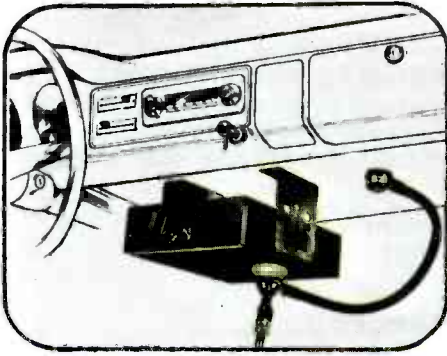


FIGURE 1. CB RADIO CABLE LOCK

with a lock such as shown in Fig.1, fits into a connector at the radio. A key is used to unlock the mechanism which releases the cable so the radio can be removed. By the way, the cable is advertised as cut-proof and the lock is said to be pick-proof.

I am sure the manufacturers of the lock had good intentions. However, I am just as sure that it's not below some determined thief to pry the whole cable lock out of the dashboard with a crowbar, thus, ruining the dashboard as well as escaping with the radio.

Alarms may be just a little better than locks simply because a loud noise will attract attention and the thieves may be noticed. Therefore, they are likely to run off without the radio. Alarms range from a simple circuit like the one shown in Fig.2 which just about anyone could install to complicated and expensive circuits which require professional installation.

Before we talk about the more expensive alarms, let's take a brief look at the simple alarm in Fig.2. As you can see, the system consists of two capacitors, two inductors, a relay, and some lamp cord. These parts can be purchased at any Radio Shack or Lafayette store. The way it works is simple. The knurl nut has to be unscrewed to remove the CB radio. Of course, unscrewing the nut closes the relay and the horn goes off. When you want to remove the radio without sounding the horn, simply disconnect the ground or the hot lead to the horn.

Another type of alarm which is more expensive and can be purchased from the Mountain West Alarm Company, 4215 N.

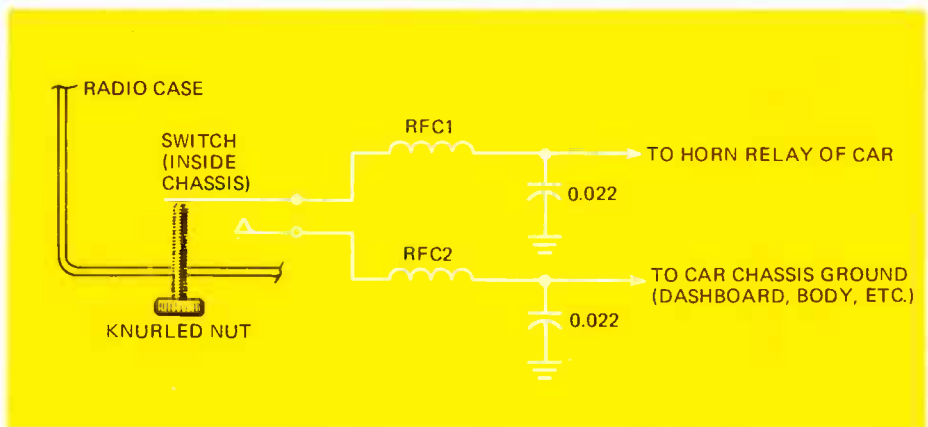


FIGURE 2. A SIMPLE CERAMIC BUBBLER ALARM CIRCUIT

16th Street, Phoenix, Arizona 85016 uses a sticky tag, similar to a band-aid which is stuck to the radio. The tag contains a printed circuit and the idea is that it will be pulled loose when the radio is removed from the car. This breaks the circuit and the alarm goes off. Cutting the wires to this alarm also causes it to sound.

A relatively new type of alarm system requires just two connections to the car battery; there's no individual sensor wiring to add. Its operation is simple.

When any accessory — dome lights, radio, CB, or brake lights — are turned on, they will draw current from the battery causing a slight, but quick, voltage drop. The voltage-sensitive electronic circuit monitors for this quick change. If it detects one, indicating that a door has been opened and the dome lights have come on, it sets off the alarm. Of course, to protect the hood and trunk, the car must have accessory lights (or some other current drawing device) installed in both locations.

Another type of alarm, which resembles a filter, connects in series with the antenna lead. It's activated when the antenna is removed from the radio unless it is switched off beforehand.

Many insurance companies no longer insure CB radios that are not installed in the car dash. If they do, there is an additional charge and the radio has to be permanently mounted in the car.

One large manufacturer of CB radios has come up with its own type of insurance policy. Basically, if you purchase one of their radios and it's ripped off, you simply mail them a copy of the police report, a copy of your receipt, and \$29 and they will send you another radio.

## HIDE IT

Hiding your antenna and/or radio in that order, is a good deterrent against

having your radio ripped off. A CB antenna installed on a car is nothing but a lighthouse for CB thieves. It leads them right to the spot. As a matter of fact, that's how thieves spot most of their "marks." Now, if there were some way to hide those telltale antennas you could prolong the life of your radio and antenna. Luckily, there is hope. Expensive but very effective, the electric disappearing antenna seems to be a solution. Once installed, you can flip a switch inside the car and make your antenna go up or down. Some electric antennas are wired so that the up and down switch also turns the power to the rig on and off.

Another cheaper, but probably just as effective, solution is to use a detachable or fold-down antenna mounting bracket as shown in Fig.3. When you leave the car, simply raise the trunk lid, disconnect the antenna from the bracket, and leave it in the trunk. Thieves assume you don't have a rig when your antenna is not visible.

Hy Gain, a large manufacturer of CB radios, makes a radio that is designed to be installed in the car trunk as shown in

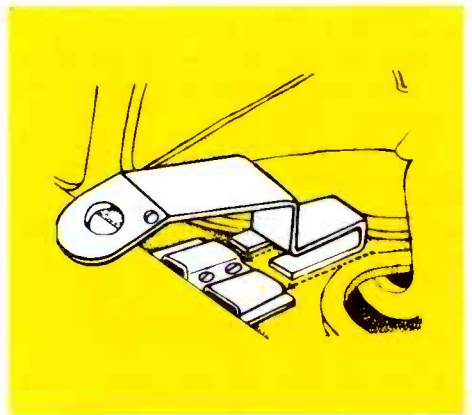


FIGURE 3 AN ANTENNA FOLD DOWN BRACKET

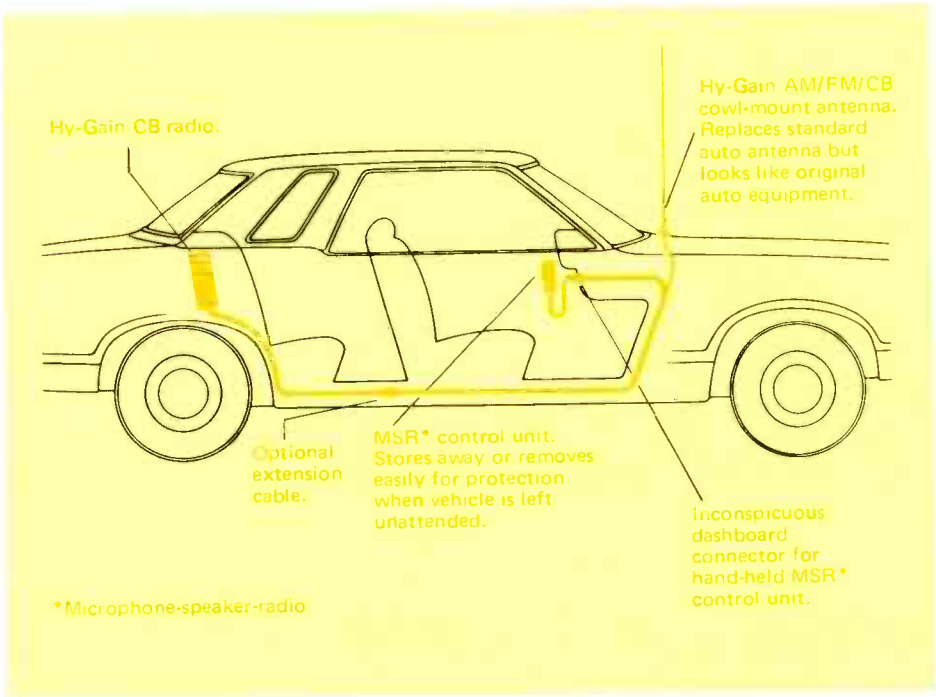


FIGURE 4. CB RADIO SAFELY MOUNTED IN CAR TRUNK

Fig.4. The channel selector is built into the microphone as well as the rig's on/off switch, speaker, and squelch control. A quick-disconnect connector mounted on the car dash allows speedy removal of the microphone for concealment in the glove compartment. To thieves who peer through your car window, you're clean and they are disappointed because there is no radio to steal.

This CB radio is also shown advertised with a combination AM/FM/CB antenna. It looks just like a regular AM car radio antenna and, therefore, should not attract attention.

### THE BEST SOLUTION

I may be going out on a limb to say this but I think the best solution to preventing the CB rip-off is to remove your radio each time you leave the car.

Of course, this gets old after a while but, treat it like a habit, get used to it, and your radio will live to be a ripe old age – much longer than 25 days.

A universal slide mount as shown in Fig.5 will allow you to remove and insert

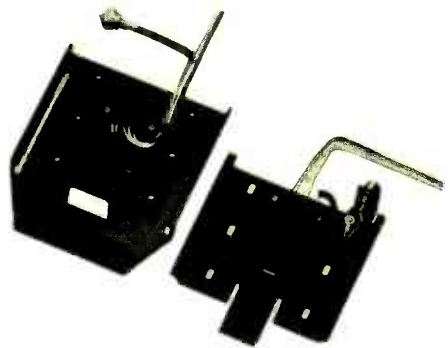


FIGURE 5. A UNIVERSAL SLIDE MOUNT



your rig in the car with relative ease. The essential wires from the radio can be soldered to contacts on a contact plate which is permanently mounted to the bottom of your radio. The other part of the universal mount is permanently mounted in the car. Connections from the power and antenna lines are made to it. The plate on the bottom of the radio mates with the universal mount in the

car. It takes a second to slide the radio in place and for the radio to be used.

The universal lock mount and a detachable antenna bracket are probably the cheapest and most effective ways to prevent the CB rip-off. Don't put off until tomorrow what you can do today. Protect your rig and antenna against the great CB rip-off. Believe me, you won't miss it until it's gone. 10-7.

# Helpful Hints 9

Figure 1 wasn't always Fig.1 to me. At one time, I thought of it as a nightmare because as a newcomer to electronics over a decade ago, I shuddered at the thought of trying to memorize it. If you are in that position now, then I believe there's hope for you as there was for me. Can you memorize this jingle?

**Biloxi's beer rots our young guts, but vodka goes well.**

If you can, then you've memorized the resistor color code. Simply pick out the first letter of each word — **BBROYGBVGW** — and you have it. Make up your own jingle if you like. Take it from me, you'll never forget it.

—James D. Crudup

COLOR	1ST FIGURE	2ND FIGURE	NO. OF ZEROS
BLACK	0	0	NONE
BROWN	1	1	0
RED	2	2	00
ORANGE	3	3	000
YELLOW	4	4	0000
GREEN	5	5	00000
BLUE	6	6	000000
VIOLET	7	7	
GRAY	8	8	
WHITE	9	9	

\*SILVER MULTIPLIER 0.01  
 GOLD MULTIPLIER 0.1

FIGURE 1. STANDARD RESISTOR COLOR CODE.

## CB Servicing Case Histories:

# The Ear Doctor

A customer brought a set in with what he thought was a bad speaker. I hooked the set up on the test bench and fed a modulated signal into it. There was no sound from the speaker, so I plugged in an external speaker that I have on the test bench and there was no sound from it either.

Then, I looked at the "S" meter and there was an indication on it, so apparently the rf and i-f stages were working properly. I decided to check the transmitter to see if the transmitter was being modulated and sure enough, the modulation was normal. Now why was the audio being developed to modulate the transmitter but not to drive the speaker during the receive condition?

I decided to try signal injection in the audio stages to see where the signal was being lost. I decided to check the squelched audio stage first. This stage, shown in Fig.1, consists of transistor Q12 and associated components. By injecting a signal at the collector

**An NRI grad takes in ailing CB sets and turns them out wall-to-wall, at a tidy profit for himself**

**by Harold Kinley, C.E.T.**

of Q12, a sound could be heard in the speaker; moving to the base of Q12, the sound could no longer be heard in the speaker. This meant that the audio was not getting through transistor Q12.

Checking the bias on the emitter to base, I found that the transistor was reverse biased to cut-off. The voltage at the emitter of Q12 is supposed to change as the

squelch control is varied. I checked the voltage at the base while varying the squelch control and the voltage did not vary as it should have—it remained constant.

So, I decided to check the squelch transistors Q9 and Q10. I removed Q10 from the circuit first and checked it. It was okay. Next I removed Q9 from the circuit and found it was definitely bad (emitter to collector short).

This was an npn transistor and I didn't think the replacement was very critical since it looked like a simple dc amplifier circuit, I looked through my RCA

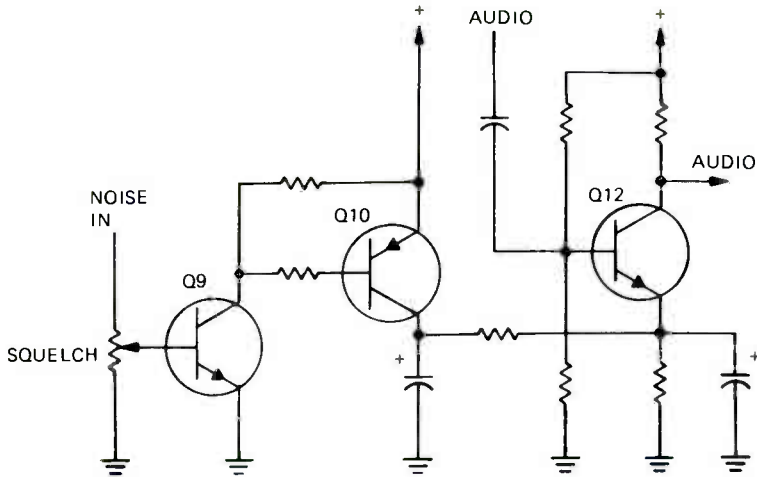


FIGURE 1 SQUELCH CIRCUIT OF SURVEYOR 2400

SK series of replacements and found an SK3122 which I thought would work okay. Installation of the SK3122 restored sound to the receiver and the squelch control also worked properly.

The reason the audio had been alright during the transmit condition was because when the transmitter is keyed, the voltage is removed from the squelch transistor. Therefore, the positive voltage is not there to cut off the audio transistor.

### KRIS 99ER

The owner brought this set in and said it would transmit fine but did not receive

at all. I hooked the set up and fed in a modulated signal and adjusted the controls, but there was no sound at all from the set.

I first suspected a bad speaker because the "S" meter had a good indication on it from the modulated signal I had fed into it. I plugged in my external speaker and there was no sound from it either. Now the trouble was beginning to look very similar to the case above.

So, I decided to check the transmitter to make sure it was modulating properly. It was. Next, I decided to go to signal tracing through the receiver audio path

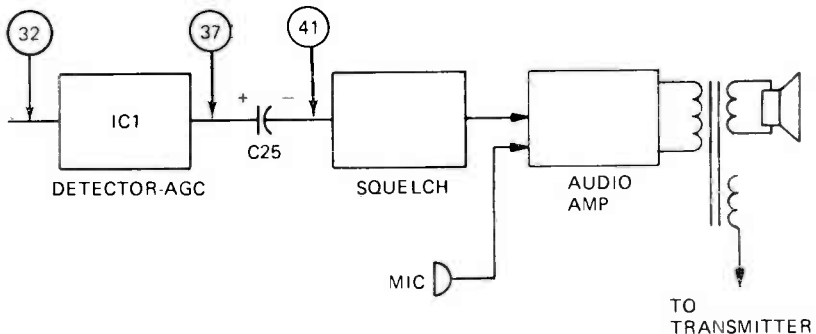


FIGURE 2. OPEN COUPLING CAPACITOR IN KRIS 99ER

## BROWNING EAGLE\* S-23 TRANSMITTER

from the detector on through to the speaker. I had one of those premature hunches that the detector-age IC was bad. This is IC1 on the schematic seen in Fig. 2.

I first injected a signal at point 32 on the schematic which is the input to the IC. There was no sound from the speaker from this injected signal. Next, I moved to the output of the IC (point 37 on schematic) and still there was no output from the speaker.

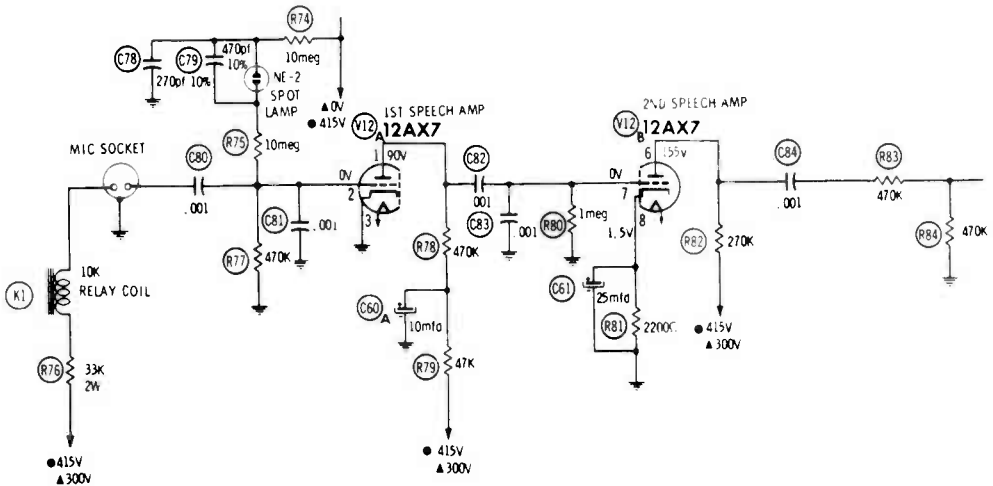
I moved on to point 41 on the schematic and the tone from the signal injector came through loud and clear. Now the only component between point 37 and point 41 is the electrolytic capacitor C25. It must be open!

I located C25 on the board and it turned out that it had one lead not connected to the circuit board. The repair was simple — just solder the lead to the board. I charged the customer only \$10 because the repair job did not take long and he was a very good customer.

The customer called first and wanted to know if I could work on his set right away if he brought it down to the shop. I told him I could since I wasn't very busy at the time. In a few minutes, he arrived and set the transmitter down on the bench.

The trouble was that the transmitter wasn't being modulated at all. First, I removed the cover and first substituted the tubes in the modulator section, V12, V13, and V14. The tube substitution made no difference so I proceeded to make some voltage measurements.

I guess I got lucky because the first place I checked was the plate of the first speech amp (pin 1 of V12) and there was no plate voltage there at all. Figure 3 shows the first speech amplifier of the Browning S-23. There were three possibilities here: either R78 was open, C60 was shorted, or R79 was open.



*Courtesy Howard W. Sams*

FIGURE 3. FIRST SPEECH AMPLIFIER OF BROWNING S 23

I checked the supply voltage at the end of R79 and it was equal to the full supply voltage. Checking at the junction of R78 and R79, the voltage was equal to the supply voltage. This told me that capacitor C60 was not shorted and that at least R79 was not open.

I decided to remove power from the transmitter to make some resistance checks. Checking across R78 showed that it was wide open. Replacing R78 cured the trouble so that the radio was now modulating fully. I charged \$13.50 for the repairs and the customer was happy.

### MIDLAND 13-866

The Midland 13-866 was brought in by a customer who lives about 20 miles from here. He said he did not know I had a shop here and that he had taken the set to the Gemtronics Company in Lake City and they referred him to me. He said the trouble with the set was that it would not receive on any channel and it would not transmit on channels 5,6,7, and 8.

I hooked up the set first to verify the complaint. It was just as he had said; the set would not receive at all and would transmit on all channels except 5,6,7, and 8. There was some slight noise heard in the speaker and the squelch control could turn it on and off.

However, the noise was not as loud as it normally is when the rf stages are working normally. This was my first clue to the receiver trouble. Using my signal injector, I first injected a signal at the base of TR17 (rf amp). Only a faint sound came from the speaker. Next, I injected a signal at the collector of TR17 and still only a faint sound came from the speaker.

Moving the base of the first mixer transistor (TR18) still caused only a faint sound to come from the speaker. Moving to the collector of the first mixer, the sound became louder but was still way

too low. I decided to stop and check the voltages at the first mixer transistor.

The collector measured 1.2 volts, far below the 8.43 shown on the schematic. Tracing back to the supply source from the collector of TR18, I measured the voltage at point 49 on the schematic, shown in Fig.4. It also was very low.

Next, I measured the voltage at point 41 and it measured just slightly higher, still far below what it should have been. Moving to point 4 (the supply point) the voltage measured 9 volts, which was normal.

I thought that one of the bypass capacitors was probably leaky, either C69 or C72. I pulled C72 first and it checked okay. Next, I pulled C69. Sure enough, it was extremely leaky. I was out of 0.02- $\mu$ f capacitors but I stopped by a television shop in town the next day and borrowed one.

Installation of the capacitor restored the receiver to normal operation, except on channels 5,6,7, and 8. Since the radio would not transmit on these channels either, I figured the trouble was probably a bad crystal. Looking at the frequency synthesis chart X2, a 23.340 MHz crystal was the one that was common to the transmit and receive functions of channels 5,6,7, and 8.

I removed the crystal and checked it on my crystal activity checker. It checked dead. The crystal checker doesn't tell anything about crystal accuracy, only whether it is active or not. I didn't have a replacement crystal on hand, but I was able to get one from the Gemtronics Company which is only 15 miles from here. They sent it out to me by UPS and I received it the next day. Installation of the crystal restored channels 5,6,7, and 8 to normal operation, both on receive and transmit.

After replacing a crystal, I always check the transmit frequencies. The frequencies on channels 5,6,7, and 8 were about 1000 Hz low. The other channels



found it would develop power output and was on channel but it was not being modulated at all. Since the receiver audio was normal, I suspected that the microphone cartridge was bad. This radio uses the ceramic type cartridge. It has been my experience that these cartridges are more easily damaged than the dynamic type of cartridge. I had some of these replacement cartridges on hand and replacement restored the modulation to the transmitter.

I now turned my attention to the meter problem. The Johnson 123A meter is shown in Fig. 5. The metering circuit is fed off the emitter of Q2, the mixer transistor. During receive conditions, a signal at the input of T1 is amplified by Q1 and fed through T2 to Q2 where the signal causes the emitter voltage of Q2 to change. This voltage change is registered on the meter as so many "S" units (not pounds), according to the strength of the signal.

During the transmit condition, a portion of the transmitter signal is fed through C73 to the input of T1. However, at the time the transmitter is keyed, diode CR16 is forward biased. This effectively places capacitor C74 across T1 to ground. Hence, capacitors C73 and C74 form an rf voltage divider at the input of T1. Since C74 is much larger than C73, very little rf will appear across C73 at the input of T1. In the transmit mode, the transistors Q1 and Q2 are without any supply voltage; however, sufficient rf signal feeds through Q1 and Q2 to cause a voltage at the emitter of Q2 to feed to the metering circuit.

My first thought (after reviewing the theory of the metering circuit) was that excessive rf was possibly being fed to T1 from the transmitter. This probably meant the voltage divider circuit was at fault. I first looked for C74 on the circuit board, and when I found it I noticed one of the leads was not soldered to the

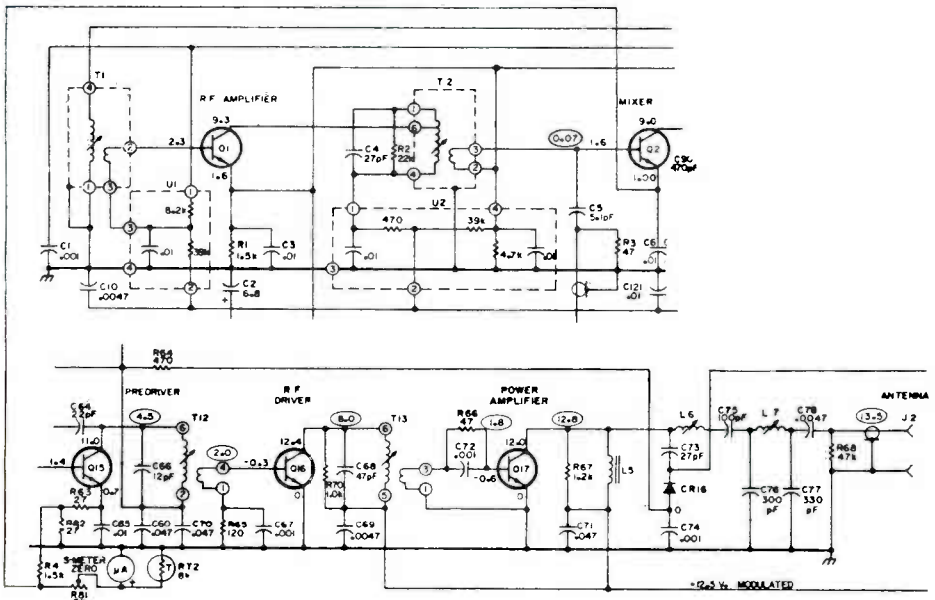


FIGURE 5. JOHNSON 123A METER CIRCUIT

board. This indeed would allow excessive rf to feed the T1 input. I soldered the capacitor in and the meter started behaving normally.

Next, I studied the sensitivity problem. Since excessive rf had been getting to Q1, I wondered if it could have been damaged. I removed Q1 and checked it on my transistor checker. It checked okay except that it didn't have much gain. I then checked an RCA SK3122 transistor for comparison and found that the SK3122 had much higher gain than the other one. I installed the SK3122 in the set and the set became much more sensitive. I'm still not sure that the transistor was damaged by excessive rf, but it seems possible.

## LAFAYETTE HB525F

The customer said that the radio went dead after his child had been playing with the switches and controls on the radio. This set has a polarity reversing switch on the rear of the set, which seemed like the only control that could have been harmed by the child switching it.

The first thing I noticed when I opened the set, shown in Fig.6, was that RFC1 had burned up before. Someone had placed a wire jumper across it, and had done a messy job, so the first thing I did was to clean that mess up! I then turned the radio over to examine the foil side

and after some close examining I found a circuit foil that had burned in half.

This was in the hot side between where RFC1 previously was and the iron core choke. I bridged this burned spot and then connected my ohmmeter across the power leads (noting the polarity). Now, there was a dead short across the power leads when the on/off switch was on.

Looking beyond the on/off switch, the first thing I saw was the protection diode. This is always a prime suspect when the polarity has been reversed. I removed the diode and sure enough, it was shorted. I checked the resistance across the power leads with the diode removed and the short was definitely gone. Replacing the diode restored the radio to service. I used an HEPI70 replacement diode. My charge was \$1 for the diode and \$16 for labor.

## KRACO MODEL 2320

The customer told me that the radio would work for a little while and then quit while he was driving along. He said the transmitter worked fine, but the receiver was troublesome. I hooked the radio up on the bench to see what was happening.

I fed in a signal on channel 11 and looked at the "S" meter for an indication, but found none. There was a faint hiss from the speaker, but this was not from the signal I had fed into the set. I

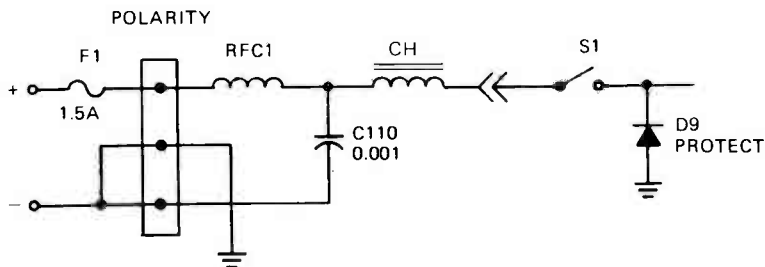


FIGURE 6. HB 525 POWER CIRCUIT



checked the transmitter to make sure it was working normally. Everything seemed to be normal in the transmitter.

I removed the cover from the radio to do some signal tracing. I applied power to the set and the radio started receiving normally. I tapped the circuit board with a screwdriver handle and the receiver stopped working – for about two seconds that is!

I could tap the circuit board and it would stop again, but it would not stay down long enough to make any tests. I did not have a good schematic diagram to work from. All I had was the little schematic that comes in the little owner's manual with the radio set. Every component was drawn so small and was so closely spaced that I could hardly distinguish the transmitter from the receiver on the schematic!

With two strikes against me I decided to tackle the job anyhow, hoping that my luck would change. I tapped and tapped on the circuit board until finally the beast stopped working and would not start again. I injected a signal at the input of the first 455 kHz i-f amplifier transistor. The tone came through the speaker loud and clear.

I moved to the input to the second mixer which is nothing but a diode. The tone didn't sound nearly so loud from this point. I wasn't sure whether this was normal or not and I was a little suspicious of that diode.

The signal injector that I use is a square wave generator which is rich in harmonics. It covers the audio frequency

range on up high in the rf range. If this type of signal is fed into the mixer input, a signal would be developed at the output of the mixer whether the local oscillator is working or not.

In this set the first i-f frequency is 11.275 MHz and the second i-f frequency is 455 kHz. Now, the first i-f frequency (11.275 MHz) is mixed in the mixer diode with the second oscillator frequency (11.730 MHz) to develop a difference frequency of 455 kHz which is fed into the second i-f amplifier stages. One sure way to determine if the second oscillator is working or not is to use a signal generator tuned to the second oscillator frequency.

I tuned the generator to 11.730 MHz and injected the signal through a 0.001 microfarad capacitor to the input of the second mixer diode. When I did this, the modulated signal that I had feeding the input of the receiver started coming through loud and clear. This proved that the second oscillator was dead.

Now which component was bad? I decided to remove the crystal first and check it on my crystal checker. The crystal was surely dead – my luck had changed! I was able to obtain a replacement crystal from the Gemtronics Company nearby. Installation of the new crystal restored the receiver to normal operation.

I charged \$21 for the repair job and it was worth every cent of it. It certainly makes me appreciate good service information after working from a schematic such as I had to work from.

## Job Ops

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This job involved a Setchell Carlson Model 23DC26. It is a floor model and belongs to my son, Jim, who brought it down from Birmingham in a station wagon. He said that the problem was that the picture did not fill the screen vertically.

I replaced the vertical output tube and damper as the latter arced intermittently when tapped. I was able to adjust the controls so a normal picture was obtained. Then, the trouble started. When

set used a power transformer with all tube filaments in parallel. Without a power transformer, the filaments would have been in series, and removal of the picture tube socket would have opened the filament circuit of all remaining tubes and I could not check for operating voltages.

The 6FQ7 seemed to be operating as I could measure ac voltage on both plates. To confirm this measurement, I got out my scope and saw normal signals at both

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plates of the 6FQ7 and the 6JT6 control grid. The 6JT6 control grid, however, was positive as shown by my vtvm. The grid-cathode of the tube should have rectified the horizontal drive voltage to produce about 32 volts negative from the

the horizontal output tube (a 6JT6) was jarred, the set lost its raster. The neon bulb in my tube tester for indicating shorts and tube leakage was broken, but the 6JT6 emission checked okay. I did not have a replacement and could not get one as it was late Saturday afternoon.

I pulled the 6JT6 and checked voltages and point-to-point resistance through the top of the tube socket holes. Everything seemed to be okay. I turned the set on with the 6JT6 not all the way in its socket so I could reach the tube pins with my vtvm probe and found there was no negative voltage on the control grid (no drive voltage).

I tried another 6FQ7, horizontal oscillator tube, which did not help. I pulled everything out of the cabinet except the picture tube and speaker so I could make voltage measurements on the underside of the chassis. This was possible because the

control grid to the chassis.

I turned the set off and disconnected the coupling capacitor feeding drive signal from the oscillator to the 6JT6 control grid. If the capacitor were leaky, it would account for the positive control-grid voltage and when disconnected the positive voltage would disappear (see Figure 1). The 6JT6 control grid was still positive with the coupling capacitor out of the circuit. I turned the set off again and measured the resistance from the control grid to the chassis. It measured only about 10,000 ohms, while when previously measured from the top of the socket (tube removed) it was 1.2 megohms, which is about what you would expect. I disconnected the 1.2-megohm grid resistor and still got the same reading. A quick check showed that this was the same resistance as measured from the 6JT6 suppressor grid to the chassis. Then

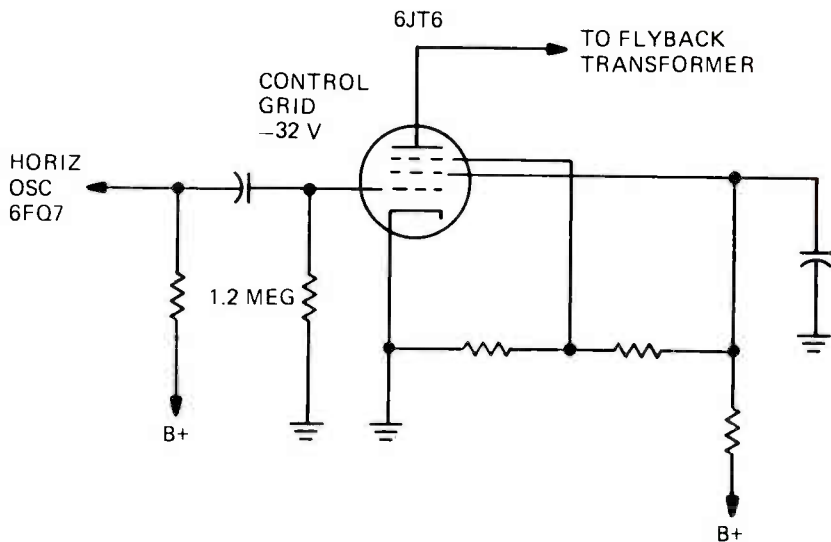


FIGURE 1. INPUT CIRCUIT OF THE HORIZONTAL AMPLIFIER.

the light dawned. There was a control-grid-to-suppressor-grid short in the 6JT6 tube. With the parts reconnected and the 6JT6 tube out of the socket, the control-grid-to-chassis resistance was 1.2 megohms as expected.

Jim left the set with me as he had to go home. When I went to my wholesaler in Montgomery, he did not have a 6JT6 and neither did any of the other suppliers. I finally found that there was a replacement tube recommended — a 6JG6 — which was in stock. When you try to buy a tube which is not available, *don't* forget to ask if there is a substitute.

With the new tube in the circuit, and after cleaning the tuner, the results were not as expected. There was poor vertical sync, due to a leaky capacitor in the vertical circuit. All of this shows that all of your equipment should be kept in first-class condition and that a tube which is shorted, making it inoperative, can still check okay as far as emission is concerned. When making an emission test, all electrodes with the exception of the cathode are tied together, so the fact that there was a short between two of

the tied-together electrodes would have no effect on the emission test. I didn't feel too bright about this job, but my son thought I was when he picked up his set, and that's all that counted in this case.

### RCA CTC 38XP

There are quite a few of these color sets in the area and I have replaced a number of defective flyback (horizontal output) transformers to restore picture tube anode voltage. This fact is mentioned as a partial excuse for the following comedy of errors.

When received, the set had good sound but no raster. There was no voltage at the anode of the picture tube. I couldn't find my neon bulb on the end of the fiber rod which I use to check for the presence of horizontal energy at the plate of the horizontal output tube, but I checked this tube, the horizontal oscillator tube, and the damper. All were okay, so I checked for melted wax at the bottom of the horizontal output transformer.

It was quite sticky, indicating that overheating had taken place due to an overload of some sort. I decided that the transformer had some shorted turns, which was not fully borne out by a scope check.

I bought a new transformer and started disconnecting the old one. However, before I was finished, something told me I was off base and that I should at least check the high-voltage rectifier, which I had neglected to do. The tube had no emission at all—I had never seen one in such a bad state before. I installed a new 3A3 tube and reconnected the loose leads on the old transformer, then replaced the chassis in the cabinet and got everything connected. I fired the set up and got good sound but no raster.

A check with my high-voltage probe showed that there was still no high voltage. I took the time to locate my neon bulb outfit and found that it lit nicely when held near the focus rectifier, which is fed from the same point as the plate of the horizontal output tube. I had previously checked the windings of the flyback so I could see no reason why there was no high voltage. I then checked the boost capacitors, which were okay, as was the new 3A3.

I thought that perhaps there was an open on the high-voltage anode lead, so I removed it and checked it with the ohmmeter—no open. I turned the set on and the first thing I knew the end of the anode lead was arcing like all getout to the chassis. This proved that high voltage was present.

I properly connected the anode lead to the picture tube but when the set was turned on there was no high voltage at the filament socket terminal of the 3A3 high-voltage rectifier tube. I removed the socket of the picture tube while the set was turned on and, lo and behold, I had high voltage again!

I carefully checked the picture tube but there were no shorts. I'd never run

into this before and figured I probably had a defective picture tube. I thought of gas in the tube so I loosened the clamp holding the blue lateral adjustment and the purity magnets so I could slide them back and see into the gun section of the picture tube. When the set was turned on and my neon bulb showed the proper glow at the focus rectifier, I noted a bright blue glow in the gun sections of the picture tube. This showed the presence of gas.

Now I knew from long experience that a tube could go gassy all by itself or gas could show up due to incorrect bias. Either condition would result in very excessive current flow and no high voltage. I decided to investigate.

I don't have the proper extension cables to operate a set when it is out of the cabinet—not directly connected to the yoke, picture tube, and so on. If I wanted to measure voltages on the socket of the picture tube, I would have to take the socket off the picture tube base and measure directly at the socket terminals. My probe is too big to fit into the socket terminals, so with the socket off I stick a lead of a 1-watt resistor down into the socket terminal and measure from this lead to the chassis.

The circuit in question is shown in Figure 2. I first checked the voltages between the blue and red grids (pin holes 12 and 3) and the chassis—they seemed normal to me, about 155 volts each. This is a positive voltage, but remember that the grid bias is the voltage between the grid and the cathode, so the fact that the grid voltage is positive when measured to the chassis is of no importance. The actual negative grid voltage is the difference between the grid-to-chassis voltage and the cathode-to-chassis voltage.

On checking the green grid (socket hole 7) to chassis voltage, I got nothing at all. There should have been some kind of a quiver of the meter needle but there was no movement at all. I switched to the



odes of the picture tube while color signals are fed to the control grids. I put in a new 12HG7 without much improvement in the picture, but this was to be expected as I had turned all control knobs on the rear chassis apron to see what would happen.

I looked up into the picture tube base end and there was no trace of a blue glow, showing that the gas had been due to the high positive control grid voltage. With the proper setup of the rear chassis controls, the receiver worked very well.

I charged \$15 labor and list price for the two defective tubes. This was much less than the \$48.50 I had quoted for the new flyback transformer, and the customer almost turned handsprings.

Thinking back, I could see where the high current drain by the misbiased picture tube could have completely destroyed the emission capabilities of the 3A3 high-voltage rectifier tube. The trouble could all be traced back to the short which developed in the 12HG7.

It is a point to remember that lack of high voltage can be the result of excess current drain by the picture tube and that this could be due to a short in the tube (unlikely), to gas in the picture tube, or to incorrect bias between the grids and cathodes.

I have found a few cases where a short existed in the high-voltage rectifier tube. Until the tube has been checked, this can be a puzzler because you can draw a high-voltage arc from the picture tube anode, indicating the presence of high voltage, but no raster. The reason is that the anode voltage is ac rather than dc. You can easily tell the difference by holding the neon test bulb near the anode lead of the picture tube. If the bulb glows, ac is present. No glow means no ac voltage. Of course, if the voltage is checked with a high-voltage probe, nothing will be indicated (on a vtvm) if ac is present.

Things might have been handled differently and with more dispatch, but on the

other hand, if I had checked the 3A3 when I checked the other tubes in the horizontal circuits, I might very well have installed a new 3A3, a new flyback, and then a new picture tube before realizing the trouble was elsewhere. Such a booboo would have been hard to live with, to say nothing of what it would have cost me!

As a closing thought, I wonder how many readers have said to themselves, "J. B. Straughn must be off his rocker. He says the picture tube control grids should be negative, but the schematic shows the grids to be a +290 volts and the cathodes at about +165 volts. The difference is 125 volts, the grids being 125 volts more positive than the cathodes instead of 125 volts more negative!"

This is a sad case in which the schematic is in error. The cathode and control grid voltages as shown are reversed! With the cathodes at +290 volts and the grids at +165 volts, the grids are -125 negative as far as the cathodes are concerned.

This is another reason why a student must learn his theory. He had sure better know more than the person who put the schematic together and labeled the operating voltages. Such errors are infrequent but they do occur, and this means that blind faith in what you see, read, or are told can lead to trouble. A good understanding of fundamentals, as given in the NRI courses, is what you need in order to avoid such traps.

I have even seen wiring errors (obvious to a trained technician) faithfully incorporated by a not-so-bright service technician in a receiver. I get such sets when the other person gives up, and so far have been lucky in spotting the built-in mistakes when looking over the schematic prior to starting work. Don't be frightened, because schematic errors are almost as rare as hen's teeth. Sams is not the only one, as I have found them in manufacturers' diagrams, a thing almost unheard of. You only have to be confident in your own knowledge—then diagram errors will be very apparent.

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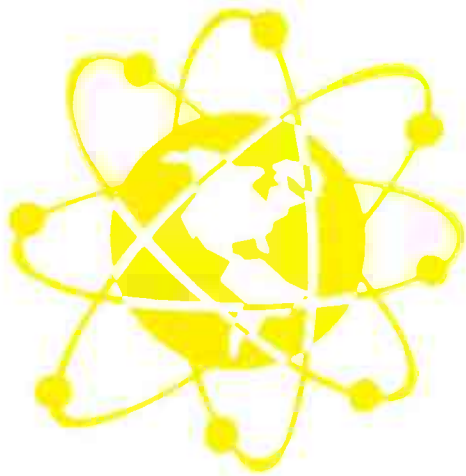
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Robert L. Gieselman, Dallas TX  
Basil V. Harington, Colorado Springs CO  
Charles W. Hayes, Kenner LA  
Jack Hejorick, Brush CO  
Frederic H. Palmblad, Colorado Springs CO  
Edward Pilecki, Boca Raton FL  
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## HAM NEWS



**By Ted Beach K4MKX**

Things never are really as simple as they seem to be. That statement could apply to lots of things, but for my purposes, I am speaking about correspondence from you people out there. On several occasions, I have gotten letters requesting help of some sort or the other. Some of my replies have been delayed quite a bit because of the way the mail is handled at the office. After coming to our in-mail section, letters are routed to the various departments to be handled. For the usual student correspondence, this routine works very well, but for personal letters or letters that must be handled by several departments, the required replies may take several days getting back into the mail.

This applies particularly to questions that are sent in along with examinations that are to be graded. This type of correspondence is handled by several different sections, and it may sometimes take weeks to get the reply back to you. For this reason, you should always send queries of either a technical or service nature separately to get the fastest possible response; *don't* enclose technical questions with your examination papers or cards.

In addition, the type of work that I do at NRI keeps me quite busy doing research, writing lessons, editing manuscripts, and trying to keep things going in general so that there is very little time left to write letters to students, as much as I would like to do so. Often, I have to turn your letters over to our Consultation staff for a studied reply, just because there are only so many hours in the day. Frequently, I take your letters home with me from the office for further study before replying. At best, however, I am a poor correspondent, and again, your question may take a while to get an answer.

In most cases, you will probably get the fastest possible response by writing directly to the Consultation department. They are quite capable, and are trained to answer your questions. If they don't know the answer to a particular question, there are plenty of our Development staff available to query, and you'll have your reply in short order. If you do write directly to me, be prepared for a fairly long wait before hearing from me!

Have you been keeping up with all the changes the FCC has been putting out? Wow! The one that makes me very happy is the "temporary" suspension of all fees

that became effective January 1, 1977. This came about as a result of a suit filed by a cable television firm and affects *all* license fees, including broadcast stations, CB, land mobile, etc. So don't send any money when you apply for a new or renewed license — at least for a while. We don't know how temporary the court order is, but we will assume that it is "temporarily permanent" until otherwise informed. If you don't see any word in any of the amateur magazines, look for it here, as we try to keep up-to-date on these matters, and will pass it along to you.

Another new twist from the FCC is the introduction of the comprehensive examination for the receiving code test. Not all of the field offices are equipped for this type of test yet, so the chances of being able to take one by choice are pretty poor right now. I do not know how many offices are presently giving these tests, but it wouldn't hurt to ask what kind of exam your local office gives *before* you go down for the test.

The test works by listening to the code tape for the prescribed five minutes. At the end, you are given a multiple choice examination on the *contents* of the five minutes of code you have just listened to. If you have gotten it all down on paper, you simply look up the right answers. However, you do not have to copy the tape perfectly, and might miss more letters than would have disqualified you under the "solid copy for one minute" rules. All you have to do is to answer the test questions after hearing the tape. This sounds real good to me, since most of my CW has been "in the head" copy for the last several years. Even though I can't write very fast, I get the big picture, and only write down pertinent information during the course of a QSO. Needless to say this is a poor way to copy solid, and has really held me back in getting my speed up (been trying to get to 20 wpm for four years!) so I could go try for that

Extra. Now (and I understand that the Washington D.C. Field Office gives the comprehensive exam), I just might be "ready" to go and take the test. We'll keep you posted.

Another fairly recent FCC rule is that applicants for all classes of amateur license must take element 3 (the Novice exam). I'm not too sure just exactly why this is being done, but you can look forward to it, even if you presently hold a Novice license. The way they work this one is that you take the examination for the class license you are applying for *first*. Then, if you pass that examination, you are given the Novice test, which you must also pass in order to get your license. In this way, the FCC is not "obligated" to give you a Novice license if you fail to pass the higher class examination, since if you fail that one, you are not given the Novice test. Sneaky, eh? Anyway, be prepared to take the Novice test when you go in for a new license.

In another order, released January 13, 1977 and adopted January 5, 1977, the FCC has made provision for issuing an Interim Amateur Permit to persons who upgrade their license class at an FCC office. This means that if you upgrade your class of license you can immediately begin to use the privileges of the new license, without having to wait for the license to be issued from Gettysburg. I'm sure that this will be welcome news for all of us.

When you pass your test, the local office will issue an Interim Amateur Permit (Form 660-B) which is good for 90 days or until the new station license is received, whichever comes first. This permit authorizes you to use your new privileges, and is covered in new section 97.32 of the FCC Rules and Regulations.

When operating under the authority of an IAP, you have to identify your station as "interim," followed by a special identifier which is shown on the permit, as indicated in new part (f) of section 97.87.

Mauro	WB2JEJ	T	Brooklyn NY
Virginia	WA4QWC	T	Winchester VA
Bob	WA4SQL	N	Alexandria VA
SC	W5MRO	G	New Orleans LA
JM	K5PSZ	A	Kingston OK
Eugene	W5TWM	-	Columbus NM
Phil	WB5WAN	N	Bay City TX
Ray	WB5WVO	N	Bridge City TX
John	WB60XM	N	San Diego CA
John	K6VOY	G	Long Beach CA
Harold	W7AYN	A	Pocatello ID
Fred	WB7EMF	G	Bremerton WA
Joe	WD8DJT	N	Iron Mountain MI
Dick	WD8DSE	T	Grand Rapids MI
Jack	WBøSXJ	T	Osawatomie KS
David	WBøYDF	-	Cologne MN
Everett	WA2JDN	G	Cedarhurst NY
John	WB2JHF	N	Washington NJ
Bob	WB4ZTC	N	Birmingham AL
Bill	WB9HZI	A*	Peoria IL

\* Just upgraded – congratulations!

On CW you would use the fraction bar ( $\overline{DN}$ ) after your call sign, followed by the special identifier given on the permit. No big deal in either case, and surely a welcome change from the old “four week wait” for the new license. Let’s hope the FCC keeps up this forward-thinking in their future rule changes.

Next time, we’ll talk a bit about some of the other things that the FCC is presently considering regarding amateur radio, and look at the proposed “new” frequency allocations for amateur use that will be decided at the 1979 WARC meeting. All in all, the Advisory Committee has done a very good job, and if we can come out with only some of their proposals, I think we’ll be pretty well off.

Now, let’s see who we have heard from since last time. As usual, those listed first are students and graduates of NRI’s Amateur courses, while those listed last are students and graduates of other NRI courses.

In addition to those listed above, I also heard from others who did not give their calls. Les Cramer, for example, wrote that he had just passed his Extra exam in Santa Barbara, California. Nice going, Les, we’re always proud to see one of our own make it to the top.

I’m not sure whether Charles Floto of New Haven, Connecticut is an amateur or not, but he wrote a nice note on using the seven segment display of the KIM-1 computer to display alphanumeric characters. Thanks much, Charles. I had already gotten that information from an issue of the *KIM User’s Notes* and am using it in a couple of programs already.

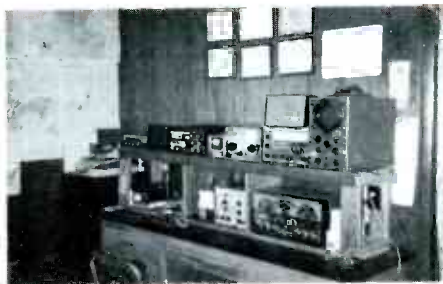
WA4QWC writes that she is just about the only YL on the Winchester repeater (22/82) and that the YML’s of the other members are now studying fast and furious on their code and theory so they can get on the air also to protect their

OM's from such a sweet young thing. Fine business, Virginia, and one of these days I'll have to check in on your evening net. First I'll have to get the crystals, and then I'll have to put up my Ringo Ranger at the home QTH as I don't think my mobile 5/8 antenna will make it all the way to Winchester!

Eugene, W5TWM, wrote asking about a problem he was having with an old Johnson Viking 500 transmitter. Unfortunately, we do not have any data on amateur equipment (other than a few older Hallicrafters receivers) and no one around here was familiar with Eugene's particular problem. Briefly, the problem appears to be an unstable vfo that drifts slowly at first and also shifts sharply when being keyed. My first thought would be the voltage regulator for the vfo, but I can't be really certain. If any of you out there have had similar ills with the Johnson, and have found the cure, give Eugene a hand by writing him at Box 342, Columbus, New Mexico 88029.

Phil, WBSWAN, is a Novice who started out with a WN call and got switched to WB under the new rules. Phil has been very active using the CONAR transmitter and has gotten very good reports from Minnesota and Illinois. Fine business. Phil — we're always glad to hear from satisfied customers!

W7AYN writes that he took and passed the Advanced test in Portland, Oregon back in December and is justifiably proud of his new ticket. Harold says: "So this Old Boy of 67 years, thinks he will retire to the rocking chair a little more often now. Will let the 'smart-lads' go on for the Extra Class License!" I don't know, Harold; the way you've been going I think you are one of the "smart-lads" yourself, and I'll bet you'll end up with an Extra ticket real soon.



WBØSXJ HAM SHACK.

WBØSXJ, Jack, writes that he is "...alive and kicking, but only on one leg. ...broke my leg Thanksgiving week so will have plenty of time to finish the NRI course and get the General ticket." Jack got his Tech license in September, but has been working the low bands only since he doesn't have any vhf equipment. The photograph shows Jack's setup.

WB4ZTC says that it took exactly six weeks and two days of impatient waiting to get his Novice license issued. And I thought that they had speeded up the process. Anyway, Bob is happy to be on the air now, and enjoys operating with his HW-101 into a long wire antenna through a home brew tuner. His first contact was with a VE7 in Vancouver, and his second was with a W6 in San Diego — not bad!

Finally, Bill, WB9HZI, writes that he upgraded from Tech to Advanced back in October and only took three tries to do it! Bill is now able to use his TR-4C and 4BTV to good advantage on the low bands. Come good weather, maybe we'll talk to one another.

That's it for this time, gang. Do let us hear from you so we can know what is going on "out there." Have a fine spring, and look for us on Field Day. We will probably be operating under the call W4DRW/4 as we have the past two years, and having a ball. See you then. Very 73— Ted — K4MKX

## 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 St., 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 Rd., Flint, Michigan. Chairman: Roger D. Donaven.

**NEW YORK CITY CHAPTER** meets at 8:30 p.m., first Thursday of each month, at 1669 45th Street, Brooklyn, New York. 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 384-8112.

**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, Penna. Telephone LU 3-7165.

**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 Ave. and Second Street. Chairman: James Wheeler.

**SAN ANTONIO (ALAMO) CHAPTER** meets at 7 p.m., 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 St., 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. Chairman: Preston Atwood.

**TORONTO CHAPTER** meets at McGraw-Hill CEC, 330 Progress Avenue, Scarborough, Ontario, Canada. Chairman: Branko Lebar. For information contact Stewart J. Kenmuir, (416) 293-1911.



## NORTH JERSEY CHAPTER WELCOMES NEW MEMBERS

Four new members were admitted at the December 10 meeting of the North Jersey Chapter. They are John Bryon, Kearney; Paul Fedisson, Jackson; Kevin McCarthy, Pinebrook; and Ben Nemeckay, Newark.

Mr. Bryon brought in an old black-and-white Magnavox television with vertical problems. A schematic was not available for this set, but several techniques were employed to find the problem and valuable troubleshooting information was gathered by the membership.

The next meeting was January 14. Nominations for Chapter officials were accepted.

## DETROIT CHAPTER BRAVES WEATHER

Ten members of the Detroit Chapter showed up for both the December and January meetings even though the temperature was never above freezing. In some cases, it was  $-10^{\circ}$  with a wind chill factor as much as  $-45^{\circ}$ .

#### NRIAA OFFICERS

J.B. Straughn . . . . .	President
Eldred M. Breese . . . . .	Vice President
Branko Lebar . . . . .	Vice President
Joseph A. Crusco . . . . .	Vice President
Les Lederna . . . . .	Vice President
Tom Nolan . . . . .	Executive Secretary

## Alumni News

Members are now working in groups on selected projects at the meetings, such as experimenting with different sections of a television receiver. This idea was proposed by Chairman James Kelley so everyone could gain more knowledge and practice in each area while utilizing the Chapter's available test equipment. Ray Berus brought in a 1948 Sears "Meteor" television for this purpose.

Oscilloscope divider probes were discussed in December. The members heard how probes are used in checking horizontal waveforms and how to compensate for internal capacitor problems caused by their shielding. It was shown that they are not suitable for use in low voltage sections since they are designed for use with high frequencies.

In January, the members used these probes to check out horizontal waveforms. The damper tube was found to be the most convenient takeoff point for this, although other areas of high voltage could be used.

With an auto transformer flyback, the plate of the damper is the low voltage point and the cathode is the high voltage point. With an insulated secondary (like

a regular transformer) type of horizontal output transformer, the reverse is true.

Gil Sager brought in a CB transceiver which was quickly diagnosed as having a defective FET. Bruce Rittenhouse found the bad transistor.

John Nagy told a story about wires being shot down by someone shooting pigeons with a shotgun. These wires were feeding one of the local racetracks. John repaired the circuits and put them back into operation just in time.

### SPRINGFIELD CHAPTER WELCOMES STUDENT AS MEMBER

Trevor Young was welcomed into the Chapter as a member even though he is still a student taking NRI courses.

Al Dorman demonstrated a Sencor CB41 automatic performance tester. This unit will test just about every part of the CB receiver that is usually faulty. It will also test power output which is necessary to stay within FCC regulations.

## FLINT/SAGINAW VALLEY CHAPTER ELECTS OFFICERS

The Flint/Saginaw Valley Chapter welcomed a new member, Robert Bauman from Saginaw, at the January meeting. Elections were held for the coming year.

New officers elected include: Chairman, Dale Keys; Vice-Chairman, Chester Mazur; Secretary, Andy Jobbagy; Treasurer, Larry McMaster; Board of Directors, Steve Avetta, Fred Malik, Cash Laferty, Bob Bauman; Membership Committee, Donald Stewart, Henry Hubbard, Joseph Madar; Goodwill Ambassador, Gerold M. Lev.

Andy Jobbagy lectured on servicing. He explained how to find a transistor base connection using a Sylvania catalog and where to look for the markings such as ECG130, etc. Also, he showed the various types of silicone heat sink compounds that are used, some of which will dry out and some which will stay fluid and make a good heat connection.

Chairman Dale Keys suggested that any student in the northern or western part of Michigan call him if they are close to Montrose. The number is 639-6688. He said he would be glad to give any information about any work that the students are having trouble with as he is still a student himself at the age of 72. Call the secretary, Andy Jobbagy, at 694-6773 for any other local problems.

At the December 22 meeting, Dennis

Besser brought in a color set with no picture and no sound. This turned out to be an input filter capacitor and was repaired in short order.

Also, Dale brought in a Zenith with no high voltage. This proved to be a horizontal oscillator problem. A Christmas celebration closed the meeting.

Andy opened the December 8 meeting by distributing new tube price listings which were increased this year and also some of the components parts price listings.

Fred Malick brought in information about CB radios, stereos, and tape recorders that can be sold to our students as well as wholesale parts listings.

Larry McMaster brought in a set with no picture or no sound. He had been working on it for a few days with no luck. Fred and Andy checked out the set and finally located the problem. The printed circuit board was cracked in a few places. These were repaired by bridging with wire and solder.

Dale has made up a special Phillips screwdriver for the Chapter. It is two feet long and can be used for removing tuners, etc. He made it to show his appreciation for help on some special service jobs.

The Chapter is now scheduling two meetings a month to catch up with some of the problems that the members have had. Any person wishing to come to the meeting should call by phone before they make the trip because sometimes the dates are changed.





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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?

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 \_\_\_\_\_ ( ) Savings  
 Address \_\_\_\_\_ ( ) Loan

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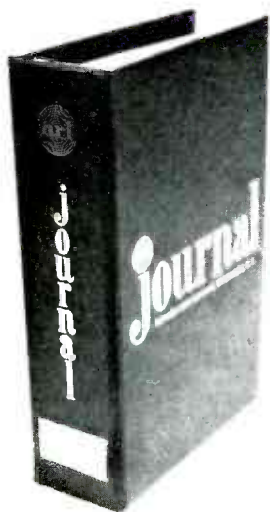
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