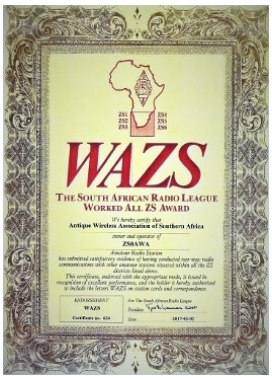
Antique Wireless Association of Southern Africa

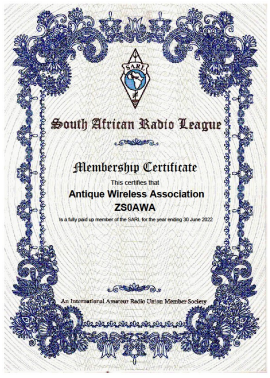
221 December 2024

Collins 51-S1

The Collins 51S-1 receiver is a versatile general coverage receiver with excellent performance in any of its three modes: SSB, CW, and AM. Frequency coverage is continuous from 200 Hz to 30 MHz using thirty selectable 1 MHz bands and a turret tuning arrangement selected by the megahertz control. The design utilizes triple conversion in the frequency ranges up to 7.0 MHz and double conversion on all ranges above 7.0 MHz. Accurate frequency determination is provided by the use of a mechanical counter for megahertz and an analog dial for kilohertz. For AM reception the passband is determined by the use of two coupled IF transformers. Selectivity in the SSB and CW modes is determined through the use of mechanical filters.

Variations of the 51S-1 (base model with cabinet) include the 51S-1F (51S-1 rack mount, no cabinet), 51S-1A (has 28 VDC input power supply), 51S-1AF (51S-1A rack mount, no cabinet), 51S-1B (similar to 51S-1 with rear-mounted military connector option).





Inside this issue:

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Reflections:

For those of you who celebrate Christmas, may your stockings be full to the brim with new and exciting things and at least some New/OS radio's and test equipment to keep you occupied for a while. I guess it's an easy way to get what you are looking for without the XYL getting too annoyed. Of course as long as you have filled her stocking to the brim with all the goodies she is looking for.

As for the rest of us we will just look for an excuse to go out and buy/swop the things we want without trying to attract too much attention. Although I see that Chanukah begins on the same day as Christmas this year, so if you celebrate there, you're in luck. You have 8 days to get all the things you want.

Any other celebrations, well you will have to work that one out yourself I'm afraid.

I still have not decided whether this is a good time of the year or not. It can become very stressful with everyone wanting to get away to holiday places or staying at home and entertaining the family. Either way it's kind of stressful to watch the bank balance being depleted bit by bit and wonder how long it will be to the next pay day.

Then of course the non-working class do not have the same kind of anxiety issues that the working class do when it comes to pay days, but the depleting of the bank account is still an issue.

When I look at the cost of some of our new toys these days I get very disheartened. Don't get me wrong here. As much as I love the old valve rigs and love using them, I am also very much a techno junkie. I love all the new integrations and touch screens and filters and plug and play. I think they are absolutely amazing. That so much can be put in to such a tiny box and do what it does, leaves me gobsmacked. Lets face it, there has to be some alien technology in those things. Even Elon would marvel at them, and I'm sure he has a couple of little green men on his team.

For those of you going away this holiday, please take it easy on the roads. I don't know if there is more carnage on the open roads than here in the cities, but still, keep your cool and stay safe out there.

To those staying home, have a safe and pleasant time with your families and friends.

We kick off the New Year with a new President and I am looking forward to hear what Chris has in store for our Saturday nets.

We have some great proposals for activities in the New Year and here's hoping we can get them off the ground.

Very 73 and 88 to you all, thanks to our committee for another sterling year and all the best for the next one. As the old saying goes, "May the Morse be with you…"

DE Andy ZS6ADY

Wikipedia

Solar Cycle:

Understanding and predicting the solar cycle remains one of the grand challenges in astrophysics with major ramifications for space science and the understanding of magnetohydrodynamic phenomena elsewhere in the universe.

The current scientific consensus on climate change is that solar variations only play a marginal role in driving global climate change, since the measured magnitude of recent solar variation is much smaller than the forcing due to greenhouse gases.

The Icom RAM module, a revisit.

On my bench by Renato Bordin ZS6REN

In the 80's, Icom released a range of radios that are still popular today. The range included a general coverage receiver, the R71, Fig 2, a range of HF transceivers such as the IC751, IC271 for VHF and IC471 for UHF. There were many other radios in the range that all had one thing in common, a digital control system with firmware, also called bios on a battery backed random access memory or RAM module- Fig 1. All these radios featured the PD7801 8bit central processing unit or CPU board and rather than have dedicated read only memory or ROM for each version of radio, Icom at the time decided on the upd444c or other static RAM chips storing radio parameter data as well as user channel memory storage. Static RAM means it requires a constant source of power to keep the memory contents available, no power no memory contents. The rational for this approach was no doubt production cost related, memory was very expensive in the 80's. This of course was a perfectly usable design approach, but the static RAM must be powered even if the radio is turned off, this was achieved with a 3V battery cell connected to the RAM chip and yes, if the battery died the contents would be lost. Each version of the radio had its own file containing instructions on how to configure the radio when turned on. The R71 for example, after power up would display the last HF frequency used and setup the PLL for the correct frequency. The IC271 will configure the PLL and display as a VHF transceiver and so on. This binary file is read by the CPU and configures the radio accordingly, display, PLL and I/O, without RAM contents the radio will display 000000Hz or other garbage and key functions will not work. Icom released a procedure to replace the battery and if your radio is still working on its original battery, I suggest you replace it today! The procedure to replace the battery is well documented and available on many websites, I use Rigpix.com for radio manuals etc.

Fig 1

Fig 2

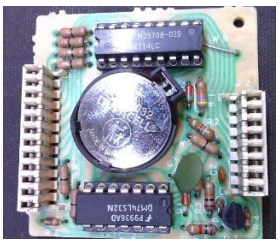


Fig 3

If your battery has died you have a few options to get the radio working again.

1. Send the radio back to Icom but not sure if Icom still accepts these radios for repair?
2. Buy Roberto Nardo's module at https://www.qsl.net/ah6rh/am-radio/ik2rnd-icom-ramboard.html
3. Follow the EB5AGB site for RW3XA or N2CBU programmers and build your own https://jvgavila.com/soft_ham/icom/ic_ram.htm
4. Follow the EEVblog with useful info here - https://www.eevblog.com/forum/rf-microwave/programming-volatile-memory-boards-in-older-icom-rigs/ by exploring Stefano's IK2OYD alternative solution, known as "HighPrecision" on the blog.

Let's just forget about option 1 and move on. Each one of the above solutions will have pros and cons but I'm going to take the "let's build our own programmer" approach to solving this problem. I also hope to structure the solution in a manner that is just a little easier to understand than what's available on the internet and use the AWA web site to archive all the binary files we need. Before we turn the soldering iron on just a quick look on how the radios CPU works, the one in the Icom range is solid state, sorry no valves here but still plenty electrons.
CPUs are essentially a bunch of transistors that on their own cannot do anything at all, not even add 1+1. A CPU relies on instructions stored in ROM that are sequentially read and executed by the CPU. If a control system with a CPU was required to 1+1 it would look something like this –

Step 1 - Move 1 into accumulator (The accumulator can be considered as a working register)
Step 2 - Add 1 to accumulator
Step 3 - Store result in memory location 10
End

Its instructions like these that are stored in ROM or the ICOM RAM module.
These instructions are read as binary words stored in ROM known as machine code and there are two basic formats. The Intel hex format and the Motorola S-reg format. I'm not sure of what Icom choose and possibly invented their own format that I do not understand. The bus architecture of these radios is insane as the CPU address and data pins do not correspond with the ad-

dress lines of the 444 RAM device. This has not helped us 40 years later trying to repair these radios without documented information on the radio's digital architecture. There are some model related binary files available on the EB5AGV's site that are compatible with their associated programmers.

The files available on the internet are not Icom released radio firmware but rather data files extracted from working radios by hams that figured out their radios would eventually become door stops. In other words, a file meant for the N2CBU programmer is not compatible with the RW3XA programmer. These solutions make use of a computer's parallel port to read and program the RAM module via a simple programming interface. Here we have our first major problem. The programming software must have direct access to the parallel port so will not run under Win 10 or 11 not even Win 7. To use this software, we need an old motherboard with a parallel port and an early operating system like XP, 95,98 or even better DOS. I cannot guarantee that this solution will work on your motherboard as bus timing is critical for these programmers. I wrote a detailed article for the AWA newsletter found here on the N2CBU's programmer that you may wish to revisit before continuing so the next chapter is just a summary.

I kept my old motherboards so we will start this exercise with the N2CBU solution first. You are going to build a simple programmer with readily available components. A 4040 counter, some Vero board, headers, DB25 connector, old DOS computer with parallel port and a parallel cable. I use a 2032 Lithium cell with battery holder for the replacement battery Fig 3, you need to get this done first else by the time you unplug the RAM module from the programmer on route to radio all the bits and bytes are gone! The schematic in the Dec 2021 newsletter is the hardware required to program the RAM module. This is unplugged from the radio and inserted on the programmer's headers. A 12V power supply is also needed. You will also need the programming software found here on the AWA website and somehow transferred to your old computer's hard drive, I guess you could probably run this exercise directly off a floppy drive, but I haven't tried this, I booted off a hard drive and note it will only work under DOS. Now it's just a case of running the ICOM-RAM.exe application, loading the binary file MY-R71.bin and programming the RAM module. The software is easy to understand, just make sure you select the correct parallel port, mine is 378. If you are not sure on your parallel port address just restart the computer in Bios, you will find the address there. Once the module is back in the radio it will boot up just fine and hopefully not present you with any other faults.

This probably sounds all complicated and it is to some extent. Finding an old motherboard with a parallel port or multi I/O card with a parallel port can be a challenge and even then, I could not guarantee that it will work, as mentioned bus timing is critical for these programmers to work. I wonder if there's a local AWA equivalent for old computers.

I then discovered Stefano, IK2OYD's work linked above.
If you followed the EEV blog link and tried to make sense of it – well done. I hope to describe the alternative solution with a bit of clarity (I hope) with all files linked on the AWASA.org.za web site.
Now, what's really needed here to get these RAM modules re-programmed is a modern device programmer that will work on a current operating system. The idea is that we use a commercial eprom or device programmer to program the Icom RAM module.
There are several appropriate programmers available on the net that will work on a laptop with Win 11. All these programmers will feature a 40-pin dual inline zero insertion force socket (ZIF socket) or DIP socket that will need a simple carrier board to accept the Icom RAM module without any modification. The layout of the adapter (courtesy I2KOYD) is shown in Fig 5. This carrier board is just an interface between the Icom RAM module and a programmer's DIP socket. Resistors R1 to R4 are pull downs - 2k2 is just fine. The complete interface board in Fig 6 is shown with some of my device programmers. This board features two rows of pins to accept the RAM module on the top side and two rows of 20 pin headers on the bottom side that will insert be inserted in the programmer. Select the DS1220 NVRAM device from the programmer's application device selection list, select the radio firmware you wish to use found here and hit program. That's it! The radio should work once the RAM module is back where it belongs.

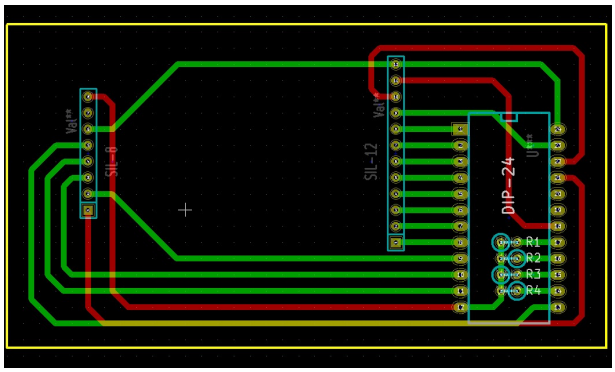


Fig5

Fig 6

If the programmer fails to verify the programming, there are several things that one should look at, first, poor solder joints on the RAM module. I've found a few modules with a clear crack around the header pins. Flux the board and reflow the solder. Also make sure that the header pins make good contact with the programmers ZIF socket. Worst case is that the RAM chip has failed and unless you can find another PD444 or 2114 RAM chip its game over…..well not quite. The 2114 static ram, of which I have a few also work. We know the RAM chip stores the operating system of the radio as well as storage for the 32 channel memories and if you are willing to forfeit the channel memory feature there is hope, more later.

For this new way of programming the ICOM RAM module, Stefano has taken the firmware files made available by N2CBU and RW3XA, and converted the files so a standard device programmer will correctly program the RAM module via the adaptor. It is also possible to read the memory module contents from a working radio using the N2CBU programmer and converting the binary file using the binsplit.exe application for use with a device programmer, you will need to offset the address to 400Hex before programming, I have tried this successfully. The list of radio binary files is not complete as almost 20 versions of these radios were made by ICOM. If you are the owner of a Radio not featured on the link, please could we get together so I can make a copy of your RAM module for the benefit of others hoping to get their radios working. It is also possible to store the IC271 binary file in the RAM module for example and plug it into a R71 receiver! The radio boots up with display at 145.000Mhz. Clearly the R71 will not work as a VHF transceiver but it does verify that the module is correctly programmed and working. I find this to be a useful test to verify my results without having a whole range of radios at my disposal.

If you have a faulty or missing RAM module there is an alternative, make your own with a memory device you can find. I burnt the binary files made available by Stefano in a few different EPROMs successfully. I've used 27c64's, 27C32's and some others using modules shown in Fig 7 and 8. EPROMs are read only devices and cannot store user memories, although limited, this simple module is ideal to assess and use the radio. I guess an arrangement such as the one in Fig 9 featuring a static RAM chip will also work but I have not tried this yet.

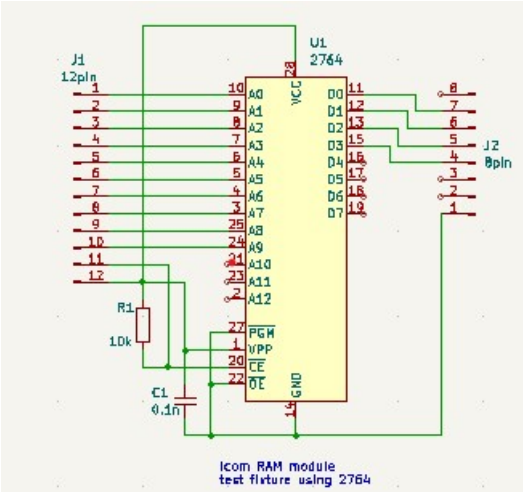


Fig7

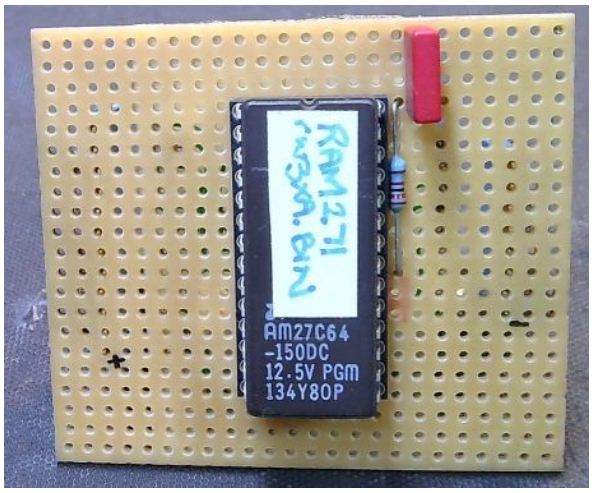


Fig 8

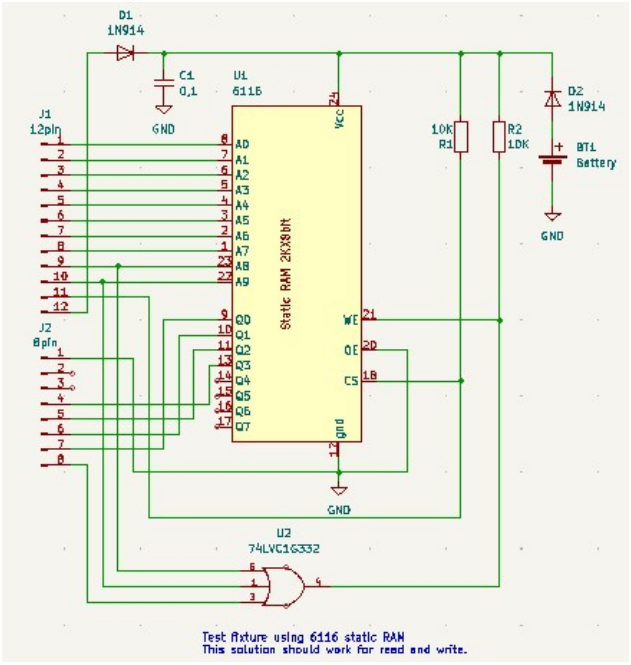


Fig9

The recovery methods described work very well, and I have successfully managed to recover R71's, IC751 and IC271 using the N2CBU and IK2OYD solution.

Thanks to Stefano for helping us get these fine radios back on air and thank you to Bruce ZS6BK for the loan R71E, I don't think your radio will ever be the same after all these tests, your beautiful HF receiver many think it's a VHF transceiver now.

If you need more detail or have any suggestions on this matter, please contact me via mail on zs6ren@gmail.com.

Genuine Signal Reports with Copyability and Strength

Signal reporting is pretty much of a ritual in Amateur Radio. Even a short, friendly QSO usually includes a signal report early in the exchange. A number of contests – but not all of them by any means – include so-called "signal reports" as part of a required exchange. Radio amateurs are experimenters. We might be trying out a new mode, a new antenna, a new transceiver, and we often play around with different power levels. Genuine signal reports are much easier with the new CS or Copyability and Strength system than with the familiar RST. RST is purely descriptive: it includes no quantitative information except for ranked categories.

Signal Readability in RST
The **R** part of RST consists of five numbers denoting different degrees of readability. All of the distinctions are useful. There are significant differences among those five levels. On the low end, the difference between "unreadable" and "barely readable, occasional words distinguishable" is helpful. At the top end, the distinction in RST **R** levels 4 and 5 conveys a minor difference between "readable with practically no difficulty" and "perfectly readable."
Nevertheless, most of us get uncomfortable if we receive an **R** report of 4 rather than 5. We shouldn't. That is, we shouldn't worry if we know that the other operator really understands RST and is actually telling us that our signals are "readable with practically no difficulty." If so, we don't need to adjust the beam. We don't need to increase the output power. We don't need to speak closer to the microphone or enunciate more clearly or use wider word spacing in Morse.
The other operator is experiencing "practically no difficulty" in understanding us. We tend to hand out RST R-5 reports far more often than we should. "Perfectly readable" signals are common enough, but signals which are "readable with practically no difficulty" occur much more frequently.
If we receive an R report of 3, however, we need to take note. Our transmissions are "readable with considerable difficulty." There is a huge gulf between level 3, "readable with considerable difficulty" and level 4, "readable with practically no difficulty."
The five levels of readability in RST are not enough to give us an accurate picture of the readability of our signals. I am not seriously suggesting that we set out to improve RST. Its problems are too significant for that, but if we were going to continue using RST, at least one more level between 3 and 4 would improve the R parameter:

1 – Unreadable
2 – Barely readable, occasional words distinguishable
3 – Readable with considerable difficulty
4 – Readable with some difficulty
5 – Readable with practically no difficulty
6 – Perfectly readable

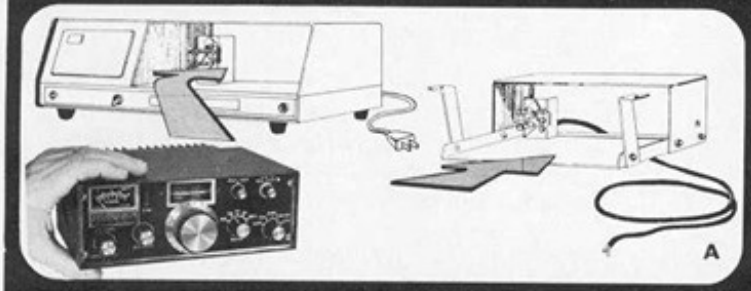
Signal Strength in Official RST
1 – Faint signals, barely perceptible
2 – Very weak signals
3 – Weak signals
4 – Fair signals
5 – Fairly good signals
6 – Good signals
7 – Moderately strong signals
8 – Strong signals
9 – Extremely strong signals

The nine levels of the RST Signal Strength scale is a pretty good list.1 Some people may quibble about the language of 4, 5 and 6, but the progression is clear and it does give scope for useful **S** reports. RST has three levels in the "strong signal" category: moderately strong, strong and extremely strong. Let's think about that "extremely strong signals" level, 9 on the RST signal strength scale. In order to grasp the meaning of "extremely" take a look at the ITU Radio Bands classification system:

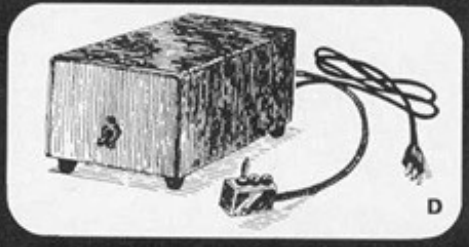
1 The list is already expanded. In 1934 the RST Signal Strength scale included only five levels:

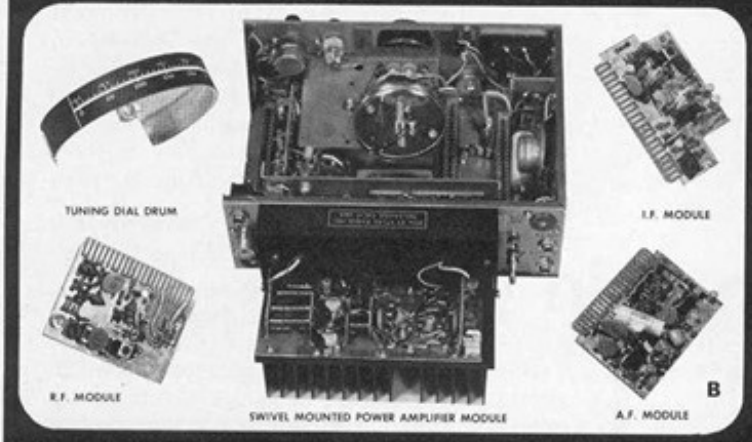
1 – Faint – signals barely perceptible
2 – Weak signals
3 – Fairly good signals
4 – Good signals
5 – Very strong signals
QST November 1934, p. 72

ATLAS' SUCCESS HAS MANY FACETS

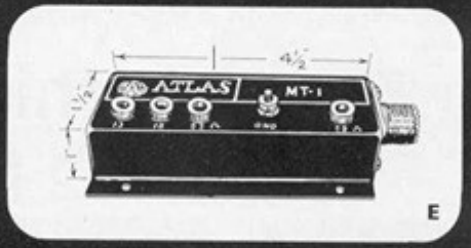

A

C


D



B



E

ONE OF THESE IS MODULAR DESIGN:

A The unique modular design of Atlas radio equipment offers many advantages. The specially designed rear connectors in the Plug-in Mobile Mount and AC Console enable you to go from fixed operation to mobile in seconds by simply sliding your Atlas transceiver into the appropriate mount. All necessary connections to power input, antenna, and mic jack are made immediately. In the AC Console, the internal speaker is automatically disconnected and the front facing speaker in the console is turned on. This is the simplest way we know of to go from fixed to mobile operation or vice versa.

B The RF, IF, and AF circuits are all on easily accessible plug-in boards, so that service on your Atlas transceiver, when required, is quick, easy and inexpensive.

C Adding the Atlas Model 10x Crystal Oscillator provides substantially extended frequency coverage for MARS operation. Frequency coverage with the 10x is: 1700-3000 kHz (Model 215x only), 3000-5200 kHz, 5800-10,000 kHz, 13,900-14,900 kHz, 20,600-21,600 kHz, 27,500-30,000 kHz (Model 210x only). The 10x has vernier frequency control, and plugs into the back of the Atlas transceiver with cable provided.

D The Atlas Portable AC Supply (Model 200-PS) is ideal to bring along on those vacations or business trips when you want to operate from your motel room or cabin. It weighs just 7 lbs., measures 5½"x3½"x6½".

E Improve your mobile antenna efficiency substantially by installing the Atlas MT-1 Mobile Antenna Matching Transformer. This device was especially designed to provide a better impedance match between mobile antennas and the new solid state transceivers, including of course, the Atlas solid state transceivers. Has broad band design, 1.8-30 MHz, 500 watt power rating, with choice of 4 impedance taps for clearly matching the base impedance to 52 ohms.

Don't let the small size (9½"x3½"x9½") and light weight (7 lbs.) of the Atlas 210x and 215x fool you. There is no other transceiver on the market with as many outstanding features. It is completely solid state design, totally broadband requiring no transmitter tuning or loading controls, provides 200 watts P.E.P. input, and offers the ultimate in sensitivity, selectivity, and overload immunity.

Model 210x or 215x	**$649.**
AC Console 110/220V	**$139.**
Portable AC Supply 110/220V	**$ 95.**
Plug-in Mobile Mount	**$ 44.**
10x Osc. less crystals	**$ 55.**
MT-1	**$ 24.**

For complete details see your Atlas dealer, or drop us a card and we'll mail you a brochure with dealer list.

ATLAS RADIO INC.
417 Via Del Monte Oceanside, CA 92054
Phone (714) 433-1983

International Telecommunications Union (ITU) Radio Bands
3 Hz to 30 Hz = **Extremely** **L**ow **F**requency
30 Hz to 300 Hz = **S**uper **L**ow **F**requency
300 Hz to 3 kHz = **U**ltra **L**ow **F**requency
3 kHz to 30 kHz = **V**ery **L**ow **F**requency
30 kHz to 300 kHz = **L**ow **F**requency
300 kHz to 3 MHz = **M**iddle **F**requency
3 MHz to 30 MHz = **H**igh **F**requency
30 MHz to 300 MHz = **V**ery **H**igh **F**requency
300 MHz to 3 GHz = **U**ltra **H**igh **F**requency
3 GHz to 30 GHz = **S**uper **H**igh **F**requency
30 GHz to 300 GHz = **Extremely** **H**igh **F**requency

Middle Frequency (MF) is in the middle of a set of bands graded on a geometric scale by orders of magnitude. No amateur bands, including the new one at 630 meters which was allocated at the 2012 WRC-12 conference, fall below the Middle Frequency range. Low Frequency (LF) is just below the middle, and High Frequency (HF) is just above the middle. The bands above and below those three categories are designated by four different levels of superlatives: Very, Ultra, Super and Extremely. Those descriptors are the same going down and going up. **Extremely** Low Frequency and **Extremely** High Frequency are just that: extreme. They are outliers. They are beyond ordinary experience. Likewise, "**extremely** strong signals" are outliers. They are beyond our ordinary experience.
Many operators equate 9 on the RST **S** scale with the approximate equivalent of S-9 on the S-meter. Look at S meter(s) on your transceiver(s). Where is S-9? Is it as high as half-way up the S-meter scale, which is also geometric? Maybe it's below half-scale. Different S-meters are set differently, but a generally-agreed standard promulgated by the International Amateur Radio Union Region 1 2 is to calibrate an S-meter so that a 50 □V signal at 50 □ impedance reads S-9. That's certainly not "extremely strong." The official language of RST says that a strength report of 9 for RST is extreme. Based on the standard wording of RST, an S-9 report in RST should be reserved for that next-block kilowatt station whose beam is pointed toward our antenna. If our S-meter reads only S-9, our RST signal strength report should be 5, or maybe 6 on a good day, never more than that, according to official RST.
2 The IARU Region 1 covers countries in Africa, Europe, the Middle East and Northern Asia.

The actual language of the signal strength portion of RST is ignored by many operators, even when they are trying to give "honest" reports. For DXing and contesting? That's a whole different can of worms. Stereotyped signal reports serve no useful communications purpose whatsoever.

Signal Strength Scale in Unofficial RST
The official RST signal strength scale is complicated and tough to remember. When RST was invented, there was no such thing as an S-meter in amateur stations. When S-meters arrived, they were game-changers:

Collins KWM-2
The analog S-meter on the Collins KWM-2 is simple and elegant. S-9 is exactly mid-scale, and the maximum signal shown is a whopping 60 decibels over S-9. Most modern transceivers are equipped with analog or digital S meters. Some go as high as 60 dB over S-9. Others top out a bit lower. Here's what those values in decibels over S-9 actually mean:

- □ **10 dB over S-9 is 10 (101) times more powerful than an already-respectable S-9 signal.**
- □ **20 dB over S-9 is 100 (102) times more powerful.**
- □ **30 dB over S-9 is 1000 (103) times more powerful.**
- □ **40 dB over S-9 is 10 000 (104) times more powerful.**
- □ **50 dB over S-9 is 100 000 (105) times more powerful.**
- □ **60 dB over S-9 is 1 000 000 (106) times more powerful.**

S-meters are helpful, since with an automatic AGC (automatic gain control) or ALC (automatic level control) commonly used on Amateur Radio rigs, very loud signals and moderately-loud signals sound about the same. Most S meters are governed by the AGC or ALC control voltages. Since the lower part of the S-meter measures S-units 1 through 9, many operators began to ignore the official verbiage of the RST strength scale and substituted those S-units, like this:

Unofficial RST Strength Scale
1 – S-meter S-1
2 – S-meter S-2
3 – S-meter S-3

4 – S-meter S-4
5 – S-meter S-5
6 – S-meter S-6
7 – S-meter S-7
8 – S-meter S-8
9 – S-meter S-9
9 plus – more than S-meter S-9

Although never sanctioned by any Amateur Radio organization, this unofficial strength scale rules the bands now when operators are actually trying to send real signal reports. This system works fine as far as it goes, but since it doesn't take into account the number of decibels over S-9 which real S-meters measure, the unofficial scale isn't accurate.

Tone in RST
1 – Sixty-cycle ac or less, very rough and broad
2 – Very rough ac, very harsh and broad
3 – Rough ac tone, rectified but not filtered
4 – Rough note, some trace of filtering
5 – Filtered rectified ac but strongly ripple-modulated
6 – Filtered tone, definite trace of ripple modulation
7 – Near pure tone, trace of ripple modulation
8 – Near perfect tone, slight trace of modulation
9 – Perfect tone, no trace of ripple or modulation of any kind

The tone part of RST is a whole different story. Look at the nine-level description. Talk about a solution looking for a problem! Tone in RST is all about power supply problems. Back in the day of the transition from spark to CW, amateurs often had to build their own power supplies from scratch. AC products in transmitted signals were a significant problem then. When was the last time you heard a signal with a "rough note, some trace of filtering" or some such description? A sign of how little attention is actually paid to the tone part of RST is the fact that T-1 is still defined as <**Sixty-cycle ac or less, very rough and broad**>. The terminology hasn't even been updated to read 60 hertz! It doesn't refer specifically to signals originating from the many places in the world where commercial power is transmitted at 50 hertz.
Signals with AC products are not completely unknown today, but they certainly are not common enough to merit a nine-level scale in every CW or other digital-mode signal report. That fact was implicitly recognized when by the time that phone modes became common in Amateur Radio, the T part of RST was dropped for those modes. Other quality problems for phone modes, overmodulation for amplitude-modulated signals and overdeviation for frequencymodulated signals, were not addressed by the RS(T) system. Most of our three-character RST reports end properly with a T-9 tone report.

Optional Suffixes in RST
The suffixes which are listed for RST do address the quality of signals. Chirpy signals and key clicks are still heard from some CW stations. The C and K suffixes telegraph those problems for CW, but the RST suffixes don't treat qualityproblems in digital and phone modes. The optional X suffix is a fine compliment. Its absence implies the same thing: There are no quality problems to report.

Genuine Signal Reporting
If we want to receive accurate reports for our radio signals, we need answers to three questions:
1) How much of our transmission can the other operator copy?
2) How strong is our transmission?
3) Does our transmission have any quality problems?
CS or Copyability and Strength with optional suffixes answers those three questions. It was first published in the February 2012 issue of QST (page 77).

Copyability and Strength or CS
C or Copyability Scale
N = no recoverable signal*
0 = discernible but not copyable*
1 = 10 % copy
2 = 20 % copy
3 = 30 % copy
4 = 40 % copy
5 = 50 % copy
6 = 60 % copy
7 = 70 % copy
8 = 80 % copy
9 = 90 % copy
G = Good 100 % copy, but short of perfect
P = Perfect armchair 100 % copy or full-quieting on FM

S or Signal Strength Scale
0 = no S-meter reading
1 = S-1
2 = S-2
3 = S-3
4 = S-4
5 = S-5
6 = S-6
7 = S-7
8 = S-8
9 = S-9
A = 10 dB over S-9
B = 20 dB over S-9
C = 30 dB over S-9
D = 40 dB over S-9
E = 50 dB over S-9
F = 60 dB or more over S-9

Optional Quality Suffixes
C = **C**hirp or tail on make and/or break
K = key clic**K**s or other **K**eying transients
O = **O**vermodulation or **O**verdeviation in phone or digital modes
R = AC **R**ipple or buzz in transmission
X = characteristic steadiness of crystal (**X**tal) control or e**X**cellent quality

For Copyability reports of N or 0, no Signal Strength report is needed.
The CS system does a much better job than RS(T) of telling the real story about our signals in a very brief format, normally consisting of two characters:

 On phone: "Your CS is papa seven [P7]." That's a perfectly-copyable S-7 signal. Excellent quality is implied
with no suffix. The suffix X could optionally be added, just as in the case of RS(T).
 On CW: "CS GA" for good 100 % copy at 10 dB over S-9, or "CS 74K" for 70 % copyability at S-4 signal strength
with key clicks.
 On PSK-31: "CS G3O" for good 100 % copy at S-3, but overdeviated.
Signal Copyability in CS
Way back in 1925, when RST was in its infancy, the American **QST** magazine reported a percentage "readability" proposal:
E. G. Watts of 4FM makes a very good suggestion regarding an addition to the present R system of stating audibilities.
The present "R9" signal only indicates a very loud signal---it may be audible all over the shack but if there is any great amount
of QRN or streetcar QRM or induction the *readability* may be way down. Why not add to the signal strength "R" signal to
indicate percent readability, thusly: 9 is 100%, 8-80%, 7-70%, 6-60%, and so on.3

E. G. Watts' proposal didn't catch on then. Maybe that was because designating 100 % with a 9 and then skipping to 80 % with an 8 is awkward. CS borrows E. G. Watts' idea, but fixes that glitch.
At the lower end, CS makes a distinction between "no recoverable signal" (N) and "discernible but not copyable" (**Ø**). The numerical digits from 1 through 9 designate 10 % through 90 % copyability. That's straightforward and very easy to remember. In practice, operators often distinguish between a signal which is just 100 % copyable and one which is not only 100 % copyable, but at an "armchair" or "full-quieting" level. CS calls the first "G" for **Good**. Copyability of "G" in CS is the equivalent of R-4 in RST. The second is "P" for **Perfect**, the exact equivalent of R-5 in RST. The five levels of readability in RST, as we've seen, are too sparse for very useful characterization, and since in RST that parameter consists of non-quantitative verbiage, it's hard to remember the details.
In some cases with manually-operated stations, it may be difficult to estimate the percentage of copyability within a resolution of 10 %, but as computer-aided operation becomes more common, we may be able to obtain real copyability measurements even finer than a 10 % resolution. The Copyability parameter of CS may thereby become automated.

C in CS Compared to R in RST
C-N = no recoverable signal R-1 – Unreadable
C-Ø = discernible but not copyable R-2 – Barely readable, occasional words distinguishable
C-1 to C-9 = 10 % to 90 % copy ≈ R-3 – Readable with considerable difficulty
C-G = Good 100 % copy, but short of perfect R-4 – Readable with practically no difficulty

C-P = Perfect armchair 100 % copy or full-quieting on FM R-5 – Perfectly readable
Note: means <is comparable to>; ≈ means <is approximately equal to>.

Signal Strength in CS
To report signal strength, CS uses S-meter readings. We all know about S-meter variations. We're radio amateurs with practical communications equipment. Most of us don't have fine-tolerance lab equipment in our stations. Although a 50 V signal with a 50 input impedance is an emerging standard for S-9 on HF S-meters, not all S-meters are calibrated that way. There is variation in receiver sensitivity, and of course our antennas differ considerably.
Nevertheless, this is no longer the early 20th century when S-meters didn't exist, and S-meters, no matter how they are calibrated, cover many orders of magnitude of signal strengths, so those differences are not very significant. Most of us now operate transceivers equipped with S-meters. Using them is the reasonable way for most hams to report signal strength.
Unlike with RST, we can properly use the numbers 1 through 9 to designate S-1 through S-9 signal strength in CS. For signals stronger than S-9, we can report so many decibels above S-9 using the letters A through F. At the very top of the scale, a signal which is at least 60 decibels over S-9 is indicated by the letter F, actually the number fifteen in hexadecimal notation. Remember that the 60-decibel level is 1 000 000 times more powerful than S-9. We report signal strength values at that magnitude very rarely, indeed. To send the maximum CS report of PF routinely is laughably absurd.

Optional Quality Suffixes in CS
CS borrows three optional suffixes directly from RST: C, K and X. The quality-reporting system in RST has one major flaw: there is no way within RST to report overmodulation or overdeviation in non-CW modes. CS remedies that by employing a single letter **O** to alert an operator about those problems. Similarly, the **tone** parameter in RST has been eliminated in CS, since it is mostly irrelevant. For those rare cases when AC power supply products appear in the signals, the optional **R** suffix can be used to flag the issue, but not to characterize it with the nine levels of the tone report in RST.

CS in Operation
CS is far simpler than RST. Unless optional suffixes are added, CS requires only two characters to make a complete report, yet it can apply to any common Amateur Radio mode. For signals with no quality problems, we only have to think about two items: **percentage copyability** and **S-meter reading**.
When should CS be used? CS, or any signal reporting system including RST, should be used only for routine contacts. Signal reporting, even if done accurately, doesn't enhance fast-paced operations like contests and DX pileups.
Contest sponsors should re-evaluate exchanges which require signal reports. What purpose do they serve when they are almost always given in stereotyped forms? Both contesters and DXers need to send exchanges which are always the same in a given contest or DXpedition operation, or at least predictable in the case of contests with serial number exchanges.
How about substituting other things like operator name or Maidenhead Field or year first licensed or whatever for contest exchanges? In some cases, the signal-report contest requirement can simply be dropped. It will not be missed and the QSO rates will increase.
Some amateurs believe that signal reports are a necessary component for a contact to be valid for Amateur Radio awards. That's a myth. ARRL and CQ Amateur Radio staff have confirmed that there is no such requirement for any awards which either organization administers.

Here is a list of contests which do not require signal reports in their exchanges:
- **All VHF/UHF Contests**
- **November Sweepstakes (ARRL)**
- **Field Day (ARRL)**
- **All ten 10-10 International QSO Parties**
- **North American Sprint (National Contest Journal)**
- **CW Mini-CWT Contests (CW Operators' Club)**
- **Northern California DX Club Mini-Sprints**
- **Rookie Roundup**

State QSO Parties for AZ, CA, CO, MD-DC, MI, MN, MT, NM, NC, OH, PA, SC, VA & WI
The same holds for DXpedition operations. Since bogus signal reports convey no useful information, they actually take up time and decrease QSO rates. Some DXpeditions may prefer to use only callsign exchanges. Should DXpeditioners wish to add information beyond callsigns, two-character Maidenhead Fields would be much more appropriate as DXpedition exchanges, since they can flag propagation changes and enable beam adjustments. Exchanging Maidenhead Fields can open up a whole new aspect of DXing, which has been formalized through the CQ DX Field Award.4
The following is an abbreviated summary of the CS Copyability Strength system which is suitable for mounting at the station position

CS Compact Summary
C or Copyability Scale
N = no recoverable signal*
Ø = discernible but not copyable*
1-9 = 10 % to 90 % copy
G = Good 100 % copy, but short of perfect
P = Perfect armchair 100 % copy or full-quieting on FM
S or Signal Strength Scale
Ø = no S-meter reading
1-9 = S-1 to S-9
A = 10 dB over S-9
B = 20 dB over S-9
C = 30 dB over S-9
D = 40 dB over S-9
E = 50 dB over S-9
F = 60 dB or more over S-9
Optional Quality Suffixes
C = **C**hirp or tail on make and/or break
K = key clic**K**s or other **K**eying transients
O = **O**vermodulation or **O**verdeviation in phone or digital modes
R = AC **R**ipple or buzz in transmission
X = characteristic steadiness of crystal (**X**tal) control or e**X**cellent quality

For Copyability reports of N or 0, no Signal Strength report is needed

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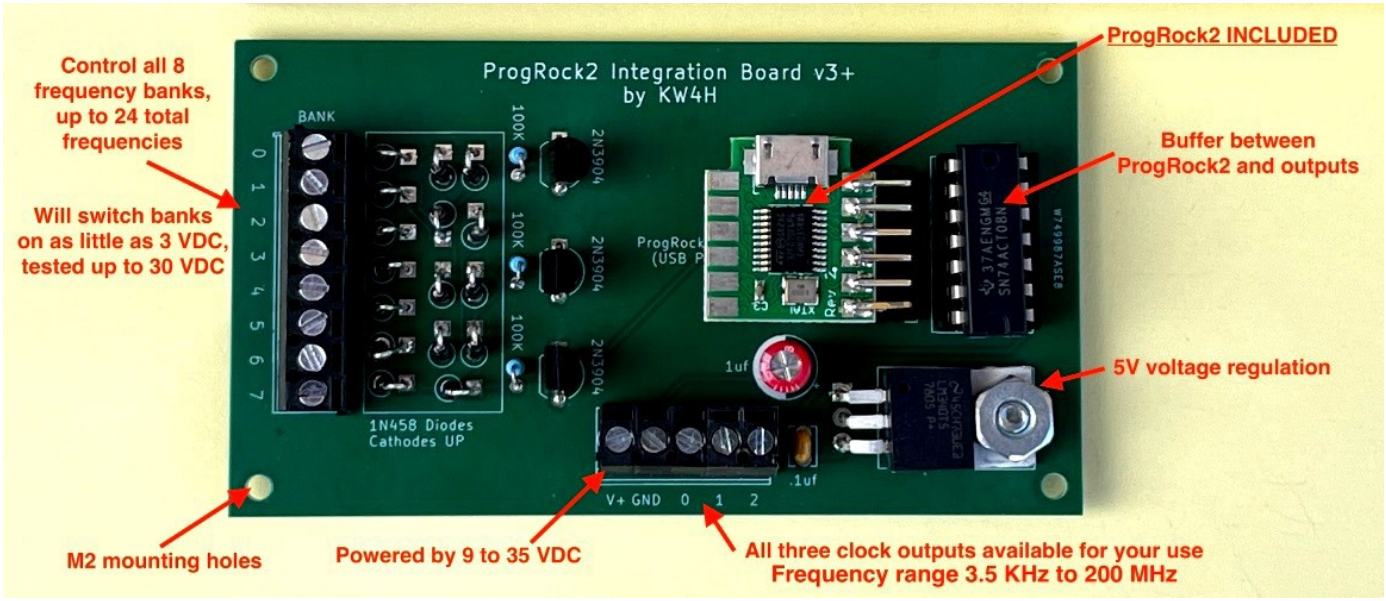
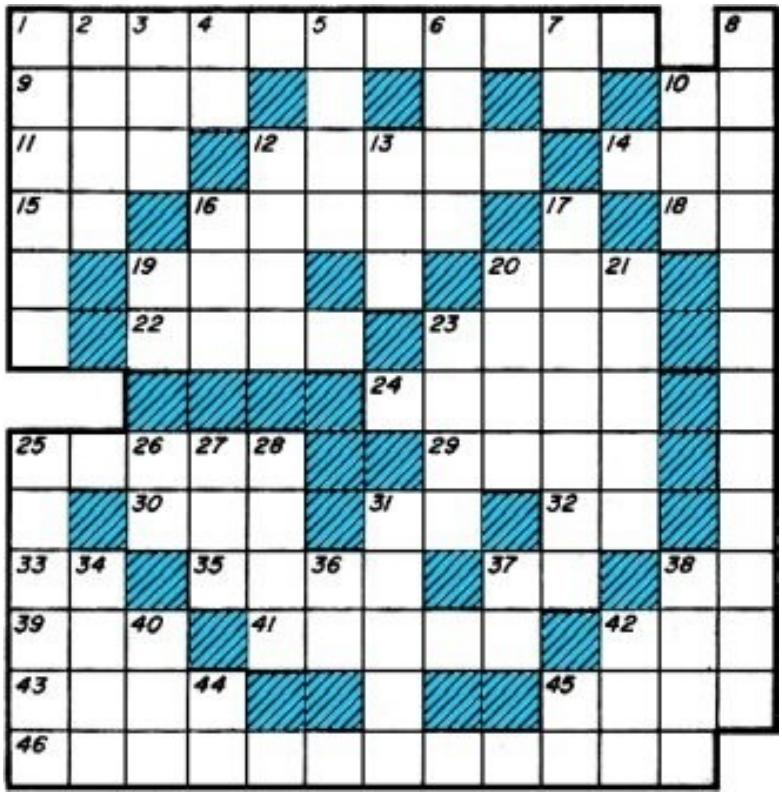
(This article was sent to us by our friend Larry AC9OX and comes out of the Radio Club of Tacoma Magazine. I am sure some of our keen restorers may find this interesting.)

IN THE FEBRUARY 2024 ISSUE OF THE BARK, readers were introduced to the QRP Labs ProRock2 device that is a highly programmable multi-frequency generating device designed to replace crystals in certain types of radio circuits. Steve, KW4H, of Vail Arizona has become an expert in the use of these amazing devices for restoration projects of all kinds. He's just released a kit version of his ProgRock2 Integration Board that makes it easy for users to build up boards of their own, without all of the required backend circuitry. Steve is a friend, and I have no affiliation with his project other than I would like to simply make others aware of his new kit version. Here's the official release notice: ***ProgRock2 Integration Board Released*** In mid-November, KW4H (Steve Reed) announced the availability of his integration board for the QRP Labs ProgRock2 "Programmable Crystal" module. Steve's integration board, which was developed over months of testing and analysis, takes care of all of the heavy lifting required to use the ProgRock2 in your projects. The QRP Labs ProgRock2 is a programmable crystal replacement that has three independent square-wave outputs with a frequency range of 3.5 KHz to approximately 300 MHz. The ProgRock2 has 8 selectable frequency banks, each with 3 independent programmable frequencies – for a stunning total of 24 frequencies at your fingertips. The KW4H integration board handles the bank switching functions for you – you just supply a switching voltage of as little as 3 VDC to any of the 8 bank selector pins. The integration board also supplies regulated power to the ProgRock2 (you just deliver anywhere from 9 to 35 VDC to the board), and also provides buffering between the ProgRock2 outputs and your project. The entire board, with the ProgRock2 mounted on it, measures only 3.4" by 1.9". The ProgRock2 is an excellent solution for restoring defective/ drifted oscillators in older gear, but is also a fine performer for integration into many other projects where a reliable, stable frequency source is needed. And if you need a sine wave instead of a square wave, QRP Labs also offers low pass filters that can be easily connected to the outputs of the KW4H integration board. The possibilities are up to your imagination! The KW4H integration board can currently only be purchased only through the "Ham Made Gear" section on QRZ. It can be purchased in three configurations: (1) Fully built and tested, with the ProgRock2 chip already onboard, (2) in kit form but you supply the ProgRock2, or (3) the bare circuit board (full DIY). You can read more about Steve's ProRock2 board at THIS LINK. Again, I have *no affiliation* with this project other than being a friend of Steve's and can vouch for how well these boards work. Over the course of last winter, he worked with both my Heathkit HR-1680 receiver and HX-1681 transmitter ("Heathkit Twins") both of which are now converted fully to ProgRock crystal replacements for all of their oscillator requirements. The ProgRock2 truly represents a leap forward for those of us who like to restore the old rigs but are hampered by the modern lack of suitable crystals. *-Dave W7UUU*





ACROSS

1 Harvey·Wells T90 is a _____

9 Inclined passageway.

10 Toward.

11 Novices are limited to 75 watts ___ abbrev.

12 I^2R.

14 Code for "Do you have anything for me?"

15 All right: abbrev.

16 In transistors, N is the _____ of electrons.

18 Diameter symbol seen on mechanical blueprints.

19 State in third amateur district: abbrev.

20 Helpful for mobile operation.

22 Better halves: code.

23 Novice who can't make General Class.

24 One of the "R's" in ARRL.

25 Type of lug.

29 Directional antenna.

30 Policeman.

31 Swan Island station prefix.

32 _____ Cobb.

33 Components of a tuned circuit: symbols.

35 Modulation used in R/C devices.

37 Type of engineering degree.

38 Initials of your favorite magazine.

39 Control grid is to electron stream as _____ is to river.

41 More cunning.

42 Leyden _____

43 Evenings before.

45 Friends.

46 Receiver type.

DOWN

1 Amplifier tube.

2 Standing.

3 Unit of current measurement: abbrev.

4 One of the magnetic poles: abbrev.

5 Radar signals were bounced off this object.

6 Layer.

7 Plate voltage: symbol.

8 Sound transducers.

10 Prefix for three.

12 Broad end of a hammer.

13 Succeeded.

16 Pasha of Tunis.

17 An antenna is used to _____ electrical energy.

19 Long distance: abbrev.

20 C.W. signals.

21 What most ham shacks are not.

23 Small amounts of speaker cement.

25 Metal alloy used by experimenters.

26 Alternating current: abbrev.

27 C.W. for "e."

28 Epic poetry.

31 One who operates code-sending device.

34 Natural opening.

36 North latitude: abbrev.

37 "Call Me _____ ": abbrev.

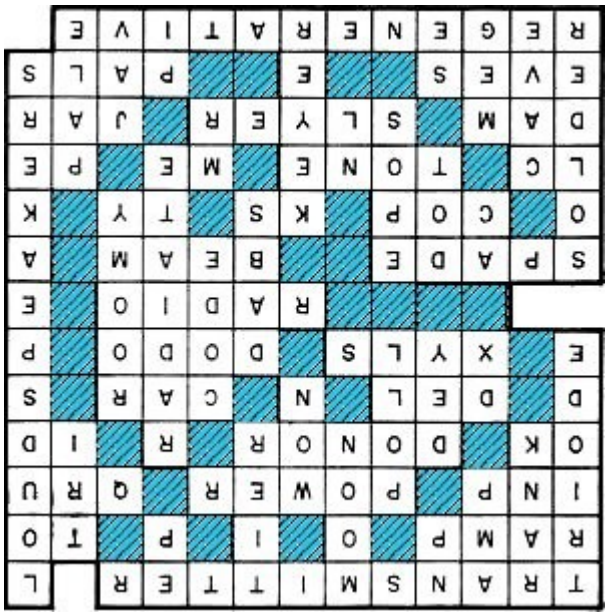
38 Pallid.

40 1,000,000: abbrev.

42 Islander with PKI ham prefix: abbrev.

44 Element used in some solid-state rectifiers.

45 Type of antenna impedance network.



CONTACT US:

WA/Telegram +27824484368
email: andyzs6ady@vodamail.co.za
www.awasa.org.za

Antique Wireless Association of Southern Africa

Mission Statement

Our aim is to facilitate, generate and maintain an interest in the location, acquisition, repair and use of yesterdays radio's and associated equipment. To encourage all like minded amateurs to do the same thus ensuring the maintenance and preservation of our amateur heritage.

Membership of this group is free and by association. Join by logging in to our website.

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Notices:

Net Times and Frequencies (SAST):
Saturday 07:00 (05:00 UTC) —Western Cape SSB Net —7.140; Every afternoon during the week from 17:00—7.140
Saturday 08:30 (06:30 UTC)— National SSB Net— 7.125;
Echolink—ZS0AWA-L; ZS6STN-R
Sandton repeater—145.700
Kempton Park Repeater—145.6625
Relay on 10.125 and 14.135 (Try all and see what suits you)
Saturday 14:00 (12:00 UTC)— CW Net—7025; 14:20 10.115/14125

AWASA Telegram group:

Should you want to get on the AWA Telegram group where a lot of technical discussion takes place, send a message to Andy ZS6ADY asking to be placed on the group. This is a no-Nonsense group, only for AWA business. You must download the Telegram App first. …..+27824484368
