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ICOM IC-707 MF/HF Transceiver

Solder-It Soldering Kit

Radioware SSTV Explorer

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Editor, *QST*

ICOM IC-707 MF/HF Transceiver

Reviewed by Steve Ford, WB8IMY

With an influx of new amateurs and much of the world still on shaky economic ground, there appears to be a movement toward less expensive radios with fewer bells and whistles. ICOM has taken a step in this direction with the IC-707 transceiver. It's as though we've journeyed back to the '60s and '70s when most radios were just *radios*—not boxes with front panels that look like they belonged in the cockpits of Boeing 767s. Of course, even a low-frills rig of the '90s is well beyond the dreams of amateurs 30 years ago. The IC-707 is a 100-W output (adjustable) AM/CW/SSB (and, optionally, FM) transceiver housed within a very compact enclosure. It covers all ham bands from 160 through 10 meters and even has a general-coverage receiver. The package also includes dual VFOs and a 25-channel memory. How far we've come!

Back to Basics

The big question, of course, is what to leave out of a low-cost radio. All you have to do is look at the front panel of the 707 and you know you're back to basics. The myriad controls and switches that decorate most MF/HF transceivers have been replaced by a mere handful. There is the **AF Gain** and **Squelch, RIT, Microphone Gain** and **RF Output.** The **Microphone Gain** and **RF Output** controls are tiny and almost go unnoticed along the bottom. Switches include the conspicuous **Power** rocker and several small pushbuttons for RIT, tuning speed, mode (CW, USB, LSB, AM and FM), noise blanker, VFO lock, antenna tuner, receive preamp/attenuator, and scan. To the right of the VFO control is a set of four pushbuttons that control the dual-VFO and memory functions. The speaker is also on the front panel, facing forward, a definite asset for mobile operating.

The upper quarter of the front panel is dominated by a large, multifunction LCD display. The operating frequency is clearly visible in oversized numerals. The S meter takes the form of an eight-segment horizontal bar graph. Operating modes and various other messages also appear in the display. The display is very user friendly and easy to read.

The back panel of the 707 is equally simple. Aside from the obligatory SO-239 antenna connector, there is an ALC jack, a computer control jack, an antenna tuner control port, a CW key jack and an external speaker jack.

The IC-707 also offers two accessory jacks. The primary jack requires an 8-pin DIN plug (not supplied). It provides connections for a fixed-level transmit audio input and receive audio output, as well as transmitter keying and accessory switching. If you intend to use the IC-707 for HF digital operating, this jack is extremely convenient. The second accessory DIN jack supplies many of the same inputs and outputs, but not all. Its primary use is for linear amplifier switching and interfacing with other (non-ICOM) automatic antenna tuners.

The computer control jack works with the optional ICOM CT-17 interface. (Aftermarket interfaces are also available from several *QST* advertisers, or you can build your own.) This interface allows the radio to work with many popular software packages that have built-in support for ICOM radios.

Finally, you need an outboard power supply for the IC-707. It requires a maximum of 20 A at 13.8 V dc. ICOM sells a companion PS-55 power supply, or you can use any well-filtered supply that can handle the current (I used my Astron RS-35A).

The IC-707 On The Air

As you can see from the results of the ARRL Lab tests in Table 1, ICOM left in plenty of basic radio performance. Our IC-707 receiver is plenty sensitive. Dynamic range is on par with other current radios in the $1000 to $1500 price range, and *a lot* better than those simpler radios of the '70s that we so fondly remember. It clearly meets or exceeds all of its specifications. But how does it really perform on the air?

The Bottom Line

ICOM's newest low-priced MF/HF transceiver offers solid basic radio performance and a good selection of features in an easy-to-use package.

Frequency Agility and Stability

Learning to use the tuning speed (or **TS**) function is essential to operating the IC-707. The good news is that it's very intuitive. I had the knack within about five minutes, which is not bad considering that I hadn't read the manual. To switch bands, you press the **TS** button until two arrows appear above the 10 and 1 MHz digits on the display. As you turn the VFO knob, the IC-707 will jump from one band to another. Press the **TS** button again when you've reached the desired band. You can then tune slowly, or press the **TS** switch again to enable faster 1-kHz incremental tuning. Tuning can also be performed from the **UP/DOWN** switches on the hand-held microphone.

The IC-707 features a *band-stacking register* as part of its memory system. This is convenient when you're switching from one band to another. If you're operating USB on 20 meters and CW on 10 meters, for example, the IC-707 will remember these mode/band settings. When you've milked 20-meter phone for all it's worth, you can switch to the 10-meter band and find yourself on CW again, ready to go.

One of my favorite tests for frequency stability is to operate a transceiver on

Table 1
ICOM IC-707 MF/HF Transceiver, serial no. 01082

Manufacturer's Claimed Specifications	***Measured in the ARRL Lab***
Frequency coverage: All ham bands 160 through 10 meters plus general-coverage receive-only from 500 kHz through 30 MHz. Extended coverage at upper and lower band edges.	As specified. Transmitter range:1.8-2, 3.4-4.1, 6.9-7.5, 9.9-10.5, 13.9-14.5, 17.9-18.5, 20.9-21.5, 24.4-25.1, 27.9-30 MHz.
Modes of operation: CW, LSB, USB, AM, FM (optional).	As specified. FM not tested.
Power requirement: 13.8-V dc ±15%, 2.1 A on receive, 20 A on transmit.	At 13.8-V dc: 1 A on receive (no signal); 19 A max on transmit (varies from band to band).
Receiver	*Receiver Dynamic Testing*
SSB/CW receiver sensitivity (bandwidth not specified, preamp on, 10 dB S/N): <0.16 μV (–123 dBm).	Minimum discernible signal (noise floor) with 500-Hz IF filter: *Preamp On* / *Preamp Off* 1.0 MHz –120 dBm / –120 dBm 3.5 MHz –138 dBm / –129 dBm 14.0 MHz –138 dBm / –131 dBm
AM (10 dB S/N): 0.5-1.8 MHz, <13 μV; 1.8-30 MHz, <2 μV.	10 dB S+N/N (signal 30% modulated with a 1-kHz tone): *Preamp On* / *Preamp Off* 1.0 MHz 4.4 μV / 4.4 μV 3.8 MHz 0.6 μV / 1.7 μV
Blocking dynamic range: Not specified.	Blocking dynamic range with 500-Hz IF filter:* *Preamp On* / *Preamp Off* 1.0 MHz 111 dB / 111 dB 3.5 MHz 115 dB / 116 dB 14.0 MHz 128 dB / 121 dB
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range with 500-Hz IF filter:* *Preamp On* / *Preamp Off* 1.0 MHz 90 dB / 90 dB 3.5 MHz 93 dB / 94 dB 14.0 MHz 87 dB / 87 dB
Third-order input intercept: Not specified.	*Preamp On* / *Preamp Off* 1.0 MHz +14.9 dBm / +14.9 dBm 3.5 MHz +1.5 dBm / +11.9 dBm 14.0 MHz –7.4 dBm / –0.5 dBm
S-meter sensitivity: Not specified	S9 signal at 14 MHz: preamp on, 15 μV; preamp off, 48 μV.
CW/SSB squelch sensitivity: <5.6 μV (preamp off).	3.8 μV.
Receiver audio output: >2.6 W into 8 Ω.	2.8 W at 10% THD into 8 Ω.
IF/audio response: Not specified.	At –6 dB: CW-N, 532-1082 Hz (550 Hz); CW-W, 425-2481 Hz (2056 Hz); USB, 392-2501 Hz (2109 Hz); LSB, 367-2418 Hz (2051 Hz); AM, 350-2400 Hz (2050 Hz).
Transmitter	*Transmitter Dynamic Testing*
Power output: SSB, CW, FM, 5 to 100 W.	Maximum power output typically 99 W, minimum power typically 3 W; varies slightly from band to band.
Spurious-signal and harmonic suppression: ≥50 dB.	As specified. Meets FCC specifications for equipment in its power output class and frequency range.
Third-order intermodulation distortion products: Not specified.	See Figure 1.
CW-keying characteristics: Not specified.	See Figure 2.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 19 ms.
Composite transmitted noise: Not specified.	See Figure 3.
Size (height, width, depth): 3.7x9.4x9.4 inches; weight, 9 lbs.	

*Dynamic-range measurements were made at the ARRL Lab standard signal spacing of 20 kHz. Blocking dynamic range measurements were noise limited at the values shown. AGC could not be defeated.

AMTOR or PacTOR from a cold start. These error-detecting digital modes demand stability. Constant drift corrections are annoying and may even cause you to lose the link.

We'll get into the 707's digital operations in more detail later. For now, suffice to say that it turned in an excellent performance on a cold December morning on PacTOR. I glanced at the tuning indicator on my KAM multimode TNC, waiting to spot the telltale signs of frequency drift as I chatted with a fellow in the United Kingdom. After 30 minutes of operation, the IC-707 was still holding its own. I was impressed.

Receiving

This transceiver has a feature not usually found on modern transceivers: A front-panel speaker. Most people who tried the '707 were pleased with the quality and the amount of audio from the radio. This feature is especially nice for mobile operation.

The 707's receive performance on SSB is very good. The audio sounded clean and clear. Filtering is adequate, but there were times when I missed having IF shift or passband tuning to reduce interference. An external audio filter, perhaps one of the popular DSP units, would help when the band is crowded.

The radio's receive performance on the

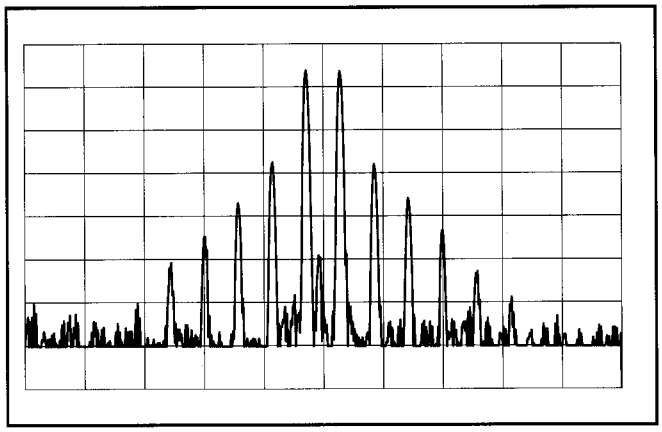

Figure 1—Worst-case spectral display of the ICOM IC-707 transmitter during two-tone intermodulation distortion (IMD) testing. Third-order products are approximately 28 dB below PEP output, and fifth-order products are approximately 36 dB down. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The transceiver was being operated at 100 W PEP output at 14 MHz.

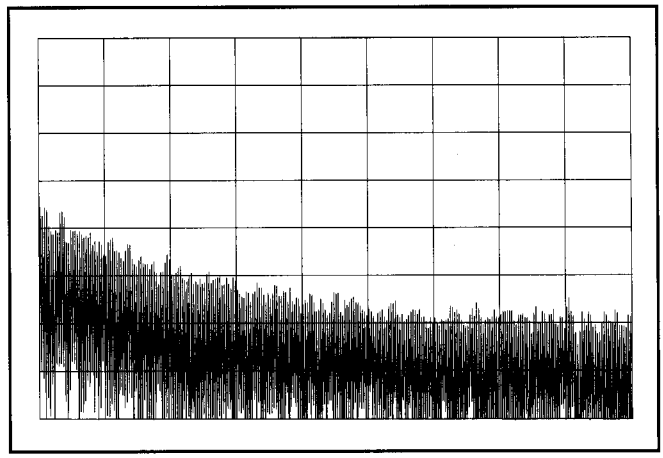

Figure 3—Spectral display of the ICOM IC-707 transmitter output during composite-noise testing. Power output is 100 W at 14 MHz. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The log reference level (the top horizontal line on the scale) represents –60 dBc/Hz and the baseline is –140 dBc/Hz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 20 kHz from the carrier.

digital modes is adequate, but the lack of a narrow IF filtering option in SSB is painfully evident. The human brain is pretty good at sorting out interfering signals, but multimode TNCs are much less flexible. I lost AMTOR and PacTOR links on several occasions when other digital conversations fired up nearby. The IC-707 manual suggests a "workaround" method of switching in the CW IF filter for digital operating. It involves using separate VFOs in the "split" mode for transmit and receive. The technique works, but it's not ideal. If you hope to use the 707 on congested digital subbands—such as 20 meters—you may want to consider installing an external audio filter between the rig and your multimode TNC. This will not work as well as tightening your IF filtering, though.

I enlisted the assistance of Dave Newkirk, WJ1Z, Senior Assistant Technical Editor, to review the IC-707. He had some insightful comments about its CW and AM receive performance:

"The IC-707 uses slow-decay AGC for SSB and fast-decay AGC for CW. The AGC settings are factory programmed and cannot be changed (nor can the AGC be disabled). The fast AGC attacks so slowly that it annoyingly "hardens" moderate to strong CW signals. (You can hear the difference by tuning in a CW signal at the same pitch in SSB and wide CW.) This, in conjunction with the radio's shrieky 800-Hz receiving pitch and audio graininess when its narrow CW filter switched in, makes CW operation with the IC-707 less than a pleasure in narrow CW and just tolerable in wide CW.

"The IC-707 receives AM signals well—if they're all alone on the band. Otherwise, the radio's wide AM-filter skirt response (40 dB down at 20 kHz) will send you leaping to punch **USB** or **LSB** to escape the interference. That done, you're in for a treat because the IC-707 receives AM as SSB very well."

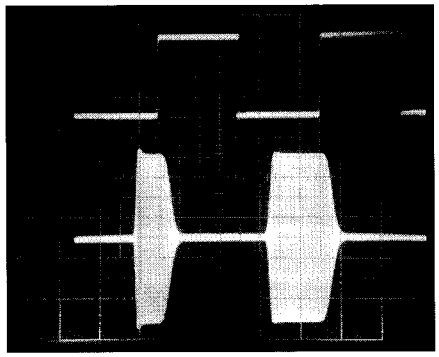

Figure 2—CW-keying waveform for the ICOM IC-707 in the semi-break-in mode. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output at 14 MHz.

Transmitting

The IC-707's transmit characteristics are excellent. I received consistently good audio reports with a variety of microphones. (ICOM includes a hand mike with the 707.) I was disappointed when I discovered that there was no *VOX* (voice-operated TR switching) function in the IC-707. This is a significant drawback, at least for my operating style.

The most glaring omission for me was the lack of a *MOX* (manually operated transmit switch). If you buy one of the optional ICOM automatic antenna tuners, the missing MOX isn't a problem. You simply press the front-panel **TUNE** switch and the tuner adjusts automatically. If you're like many hams, however, you probably use a manual antenna tuner. To adjust the tuner you need to switch the IC-707 into a continuous transmit mode.

How do you accomplish this? You can use the microphone PTT switch or an outboard switch connected to the PTT line as a MOX switch in the CW mode to get a continuous signal. (If you haven't plugged in a key, doing so will transmit a carrier.) Keying the transceiver with one hand and adjusting the tuner with the other is awkward, but it works.

The IC-707 performed very well in the digital modes. Transmit/receive switching time was more than adequate for AMTOR and PacTOR. I enjoyed several digital DX contacts with little difficulty. The 707's performance was particularly impressive when using Baudot RTTY. The manual cautions you to limit your output to 50 watts, but I couldn't resist running it all the way up to 100 watts. During a couple of long-winded RTTY conversations, the IC-707 hardly broke a sweat. Its whisper-quiet internal cooling fan kept the rig from getting too hot under the collar. There's no doubt that the transmitter is plenty rugged. We ran it key-down at full power into a dummy antenna for a half hour without any signs of distress.

Although the purists will tell you there's no substitute for the monster tube-type rigs of the '60s, the IC-707's AM performance is fine. Several stations even commented on the good audio quality. The rig's maximum AM output power is 25 watts. FM is

optional in the IC-707 and this function was not tested.

On CW you can use so-called "semi-break in." Unfortunately, the hang time is adjustable only through an *internal* potentiometer. This is annoying because I often needed to adjust the delay time for operation at different speeds. Most of the time, especially during slow-speed ragchews, I prefer to use a foot switch or flip a front-panel transmit switch to avoid playing "beat the relay." As Figure 2 shows, there is some shortening of the first transmitted character, but the waveform is fine. The CW signal sounds good on the air.

Summary

The IC-707 provides good basic radio performance for new hams and veterans alike on a budget. ICOM left in a good mix of features to make operating pleasurable and convenient, and the radio is really easy to use. You may miss VOX and a selection of receive filtering options in crowded phone and digital subbands, but the tradeoff is a rugged radio that can withstand considerable abuse. The IC-707 makes a fine mobile or portable transceiver—and it works well in your home station for many less-demanding applications.

Manufacturer's suggested retail prices: IC-707, $1032; AT-150 HF automatic antenna tuner, $539; AH-3 HF automatic antenna tuner, $594; PS-55 dc power supply, $265; SM-6 desktop microphone, $82; CT-17 CI-V level converter, $105; FL-52A 500 Hz CW filter, $137; FL-53A 250 Hz CW filter, $137; UI-9 FM unit, $80; MB-5 mobile mounting bracket, $43. Manufacturer: ICOM America, Inc, 2380 116 Ave NE, Bellevue, WA 98004, tel 206-454-7619; Brochure hot line 206-450-6088.

Solder-It Soldering Kit

Reviewed by Mike Gruber, WA1SVF

No doubt about it—soldering is essential to almost any electronics project. As many hams and hobbyists have discovered, it is also a great way to make many home repairs. Unfortunately, solder is not without its limitations and drawbacks. Electronics-type solder, usually a mixture of 60% tin and 40% lead with a rosin-core flux, works on a limited number of metals. And, as Murphy's Law would have it, the most critical soldering jobs are always just out of reach of an extension cord. The Solder-It kit is intended to overcome both of these limitations. The kit includes a refillable butane pencil torch, torch stand, syringes with solder pastes for a variety of materials, and a vinyl plastic storage pouch.

Soldering Torch

I find the quality and performance of the torch to be consistent with its price tag. It seems well made and durable. It's an excellent choice for general purpose and home hobbyist soldering. The torch isn't a replacement for your soldering iron, but it is an excellent choice for soldering wires outdoors.

Butane for the torch must be purchased separately. It's widely available as fuel for refillable cigarette lighters. I purchased a 2.5- ounce container (large enough for several torch refills) for $2.39. Filling the torch is a snap—just press the butane container nozzle into the torch valve. According to the manufacturer, a refill lasts an hour or more. Although I didn't time it, a fill-up did last a surprisingly long time. Fuel did not appear to leak, even when the valve was closed and the torch left idle for several weeks.

ARRL staffer and resident antenna expert, Dean Straw, N6BV, reports excellent results with a Solder-It pencil torch while at the top of his 120-foot tower. He cautions, however, that even moderate winds have an adverse effect on the torch's flame and heating ability. Solder-It is introducing some optional wind-proof tips, but these were not available for the review. Dean also admits to more than one accidental drop test and recommends a tether line from the torch body to the tower.

The plastic torch stand, which looks a bit like a top hat with the top cut out, holds the torch upright on a flat surface. The kit includes two types of tip attachments: a "blow torch" and a soldering iron tip. Thirteen optional tips, including a hot knife and a variety of chisel and wind-proof tips, can be purchased separately. Solder-It also offers a lighter-duty optional torch that's a little easier to carry around. You can specify either torch with the kit, or buy them separately.

The Solder Paste Syringes

I find the specialty solder-paste syringes handy to use. Flux and solder are contained within the paste, so there are no messy flux brushes to clean or replace. You just apply the paste to the solder joint and heat. It's that simple.

As with any product of this type, the importance of eye protection and proper ventilation cannot be overemphasized. All of the solder pastes contained within this kit tend to smoke and splatter. Always be extra cautious whenever using a torch or any unfamiliar type of solder.

All of the solders in this kit are specified to have a low, or very low, melting point. The silver-bearing solder, in fact, is even touted to work with the heat of a match or lighter. Keep in mind, however, that these low-temperature claims are relative to solders in general, not to the familiar 60/40 rosin-core solder used in electronics. The

The Solder-It kit comes with a heavy-duty torch (center) and a variety of solder-paste syringes. The light-duty torch (left) is optional. The torches run on butane normally used to refill lighters (right), which you can purchase from many drug or discount stores.

The Bottom Line

The Solder-It kit offers the ability to solder an unbelievably wide range of metals. For the antenna experimenter, it makes a compact package good for extended use in the field and on the rooftop.

melting point of 60/40 is actually a bit lower than these Solder-It products.

Aluminum solder. Aluminum solder has many uses around the household or shack. Refrigeration systems, radiators, storm doors and windows are all potential candidates for aluminum solder, but antennas are no doubt of most interest to amateurs. Who hasn't broken an element or two on his favorite Yagi at one time or other—I know I have! One antenna repair could save enough to pay for the entire Solder-It kit.

I've tried aluminum solders before, with disappointing results. Aluminum has always been difficult to solder, but the Solder-It product boasts not only of soldering aluminum to aluminum, but of soldering aluminum to other metals as well. The specified melting temperature is 395°F. The tensile strength is 28,000 PSI with a finished joint that is stronger than the base metal. The color match is ideal on aluminum.

I used several aluminum and other metal samples to test the aluminum solder paste. I achieved acceptable results in almost all cases, including aluminum to aluminum and aluminum to brass. Some types of aluminum—roof flashing for example—cannot be soldered with this product, but it works fine with 3003, 6061, 6063 and other alloys I've used for antennas and equipment enclosures.

It takes a little practice to develop the technique. Be sure to thoroughly clean the surfaces to be soldered (I used steel wool) and apply heat only around the solder paste until it begins to bubble. Now apply heat directly to the joint until it flows, then immediately remove the heat. I recommend a practice joint before attempting anything critical.

Pot Metal Solder. One of my other hobbies is the restoration of a 1952 MG TD. During a carburetor overhaul session a few years back, I was a little less careful than I should have been with the one of the float-chamber covers. As you have probably guessed, much to my chagrin, that precious little lid was made of pot metal! At that time, I had no way to repair it, and finding another exactly like the original was both difficult and expensive. Ouch!

Pot metal, and similar die cast metals, contain zinc. Its popularity stems in part from the ease with which it can be cast. Relatively low casting temperatures, minimal die wear and good surface finish make pot metal parts cheap and easy to produce. You'll find pot metal in carburetors and other car parts, trophies, junk jewelry and toys. I have even encountered pot metal on my antique crank-up Victrola machine! The down side to pot metal, of course, is a lack of durability. It's not particularly tough stuff.

Enter Solder-It pot-metal soldering paste: I tested it by joining the wings of two die cast toy airplanes. I cleaned both mating surfaces with sandpaper and applied the paste. The metallic shine of the metal solder soon began to emerge from the paste and form a molten ball. Shortly thereafter, the solder began to flow and I removed the heat.

When the joint cooled, I tested its integrity by bending the wings, both of which broke before the joint. I was extremely impressed with the results, and can recommend this product for making pot metal repairs. Again, make several practice joints before attempting anything critical. The flow characteristics are considerably different than with other solders. The syringe label indicates that the solder has a melting temperature of 400°F with a tensile strength of 22,000 PSI.

Silver-Bearing Solder. The silver-bearing solder performed well in all cases that I tried, including copper and brass joints. It is also specified to work on other metals, too, including bronze, nickel, platinum, chrome, monel, stainless steel, galvanized metal, gold, silver, coated steel, cast iron, black steel and steel. The sales literature says that this solder is very conductive with a 2% silver content, and a joint that is 5 to 10 times as strong as conventional solder. Neither tensile strength nor conductivity are specified, however. The syringe label indicates that this solder has a melting temperature of 430°F.

The sales literature also touts this solder as being particularly useful for soldering PL-259 connectors. I tried using the paste to solder PL-259s, but found that conventional wire-type rosin-core solder is easier to use because it allows more control over the amount of solder added to the joint.

The literature indicated that conventional 60/40 solder has a melting point of 610°F, which is inconsistent with other references that peg it at 361°F—somewhat lower than the Solder-It silver paste. A telephone call to Richard Bell, who developed the Solder-It syringe concept, revealed that the literature was in error. Richard explained, however, that although they have a higher melting temperature, the tiny solder particles in the Solder-It silver paste melt sooner than wire solder because of their small size. My personal feeling is that even if the smaller solder particles melt sooner, a good joint still requires the PL-259 connector body, or any work piece, to be hotter than the solder's melting point. A higher melting temperature therefore still translates into higher connector body temperatures during the soldering process.

I decided to ask several HQ staffers with varying levels of soldering experience to try soldering PL-259s with Solder-It paste and conventional solder. They all found it easier to work with conventional solder. (Of course years of conventional soldering experience is no match for the few minutes spent with the Solder-It product. With practice, you may prefer paste to wire solder for soldering PL-259s.)

Plumber's Solder. The old favorite of plumbers, 50% tin and 50% lead, has been banned for several years because of concern over the health hazards of lead contamination in our water. The most common replacement plumber's solder is 95% tin and 5% antimony. Although 95/5 is considered far less hazardous than 50/50, there are still heath concerns about the antimony. The Solder-It product boasts no lead, cadmium or antimony. The tube's label, however specifies that it contains copper.

This solder has a melting temperature of 430°F and can be used on copper, brass, stainless steel, nickel and bronze. The label also states that the finished joint is a bright silver that will not tarnish or blacken. Its tensile strength is not specified, but the label indicates that it is five times as strong as ordinary solder.

I used a sample piece of 1/2-inch type L copper tubing and a 90° elbow for my test solder joint. I cleaned both mating surfaces to a bright metallic shine with steel wool before applying the solder paste. Using the pencil torch, I heated the assembled joint. The result was a perfect solder job the first time, but the following should be noted:

1) The pencil torch works fine, but it's not a replacement for an acetylene or propane torch if you have a lot of plumbing to do. Although I used the hottest portion of the flame, the tip of the inner blue cone, it took a while to sufficiently heat the joint.

2) Once the joint is assembled, it is more difficult to add solder and control the amount of solder in the finished joint with the paste than with wire solder. The paste sometimes runs off if the work is already hot, and the plastic syringe tip can melt if it touches the metal. The amount of solder in my initial test joint was minimal but adequate.

Conclusion

As a radio amateur, hobbyist and home owner, this kit impressed me. It offers the ability to solder an unbelievably wide range of metals. As an antenna experimenter, I also like soldering capabilities in the field, and on the rooftop and tower without the need for a long extension cord or recharging batteries.

You can expect a learning curve with each of the solders in the kit. The torch seems to be of good construction, and the pastes eliminated the need for a flux can and brush. Each of the solders performed as well, or better, than I expected. In terms of dollars and cents, I can think of several repairs to antennas and car parts that would have more than paid for a Solder-It Kit. It can be extremely handy to have in anyone's toolbox or workshop.

Manufacturer: Solder-It, Box 20100, Cleveland, OH 44120; tel 216-721-3700. Manufacturer's suggested retail price: Solder-It soldering kit, $59. Additional torch (standard or light duty), $39; replacement solder-paste syringes, $6; optional tip attachments, $5 to $14.

Radioware SSTV Explorer

Reviewed by Paul Pagel, N1FB

The world we live in is truly graphics-oriented. We've come a long way from the pinhole camera to the CCD (charge-coupled device): still cameras, motion-picture cameras, then TV, minicams and computers are all part of it. Along the way, Amateur Radio fell into step, too. Early on, there were the primitive—as well as amazingly inventive and complex—RTTY pictures. Then came fast-scan TV (FSTV or ATV) and slow-scan TV (SSTV); even packet radio got into the picture.[1]

For many years, Robot was the dominant force in Amateur Radio's world of video. Although Robot's machines and modes will be with SSTV for years to come, the evolution of the personal computer has changed SSTV's orientation. With the introduction of several commercially available SSTV systems that operate in conjunction with a PC, operating fax and SSTV became cheaper and more flexible. And, because of their relatively low cost and ease of implementation, fax and SSTV are arguably the more popular of the video modes. John (WA2PYJ) Montalbano's ViewPort VGA,[2] Ralph (WB8DQT) Taggart's *FAX480* software series,[3] John (WB2OSZ) Langner's Pasokon TV,[4] and most recently, Ben (K3BC) Vester's inexpensive SSTV system[5] have contributed greatly to the growth and popularity of amateur fax and SSTV.

Generally speaking, hams are always itching to try something new. It's understandable that when hams have a yen to try a new mode of operation, they like to do so with a minimal investment of time and money. If SSTV is new to you, perhaps all you'd like to do at first is eavesdrop—hear and see what's going on and copy a few pictures. With the $50 SSTV Explorer, you can do just that.

The SSTV Explorer is a development of John Langner, WB2OSZ, creator of the popular Pasokon SSTV system. In fact, the screen display is *almost* identical to that of the original Pasokon software display. A close inspection reveals the main difference: The transmit capabilities are absent and not all of the modes the Pasokon covers are present. A list of the Explorer's features and the equipment needed to use the SSTV Explorer is presented in the sidebar "The Explorer's Features and Requirements."

What's in the Box?

The SSTV Explorer package contains four items: a 5½-foot black cable terminated with a metallized-hood, DB25F connector at one end, and a ⅛-inch-diameter, two-conductor audio plug at the other end;

The SSTV Explorer.

a 3.5-inch, 1.44-Mbyte floppy disk (you can get a 5.25-inch disk, too) and a 27-page instruction manual. As with most software, there's a READ.ME file and some .DOC files (four, to be exact) that you should read in addition to the instruction manual. Once you've filled out a simple program-configuration file (*SSTV.CFG*), you run the DOS-based software (this is not a Windows program), tune in an SSTV signal and *presto!* you're receiving SSTV pictures!

The electronics are contained on a small PC board mounted within the DB25 connector that attaches to your IBM-compatible computer's serial port. The 1/8-inch plug at the other end of the line attaches to the audio output of your receiver (use your receiver's auxiliary audio output for convenience).

Don't expect a lot of detail from the manual. It sufficiently covers the necessities of operating the Explorer and that's about it. There are no technical details of the hardware, software or file formats included. There's no schematic of the demodulator circuit either. In short, the manual does its job for the important points, but there may be times when you wish it contained a bit more detail.

Playing With the Explorer

Figure 1 is a shot of the SSTV Explorer's main screen. The software uses a low-resolution display mode (320×240 pixels and 256 colors), so the lettering and mouse arrow are large and easy to read. Much like a Microsoft Windows program, you can use a mouse and/or the keyboard to control the Explorer. To receive a picture, you select the mode being sent (Function keys F1-F7 can be employed here), point the arrow to the **Receive** button and press a mouse button (or press the **Enter** key). The mouse arrow disappears and the incoming picture presents itself in the main menu's window. If you're not autosaving pictures, you press a mouse button (or a keyboard key), to return to standby mode.

I'll step through a quick overview of the important pull-down-menu actions:

- **Desk**—Allows you to shell to DOS.
- **File**—You can open or save a file;

The Bottom Line

The SSTV Explorer is an easy and inexpensive way to sample the fun of SSTV and interest others in Amateur Radio.

SSTV Explorer's Features and Requirements

- Reception of the most popular SSTV modes: Robot color (12, 24, 36 and 72 second); Robot black and white (8, 12, 24 and 36 second); Martin (M1, M2, M3 and M4); Scottie (S1, S2, S3 and S4) and Wrasse SC-1 (24, 48 and 96 second).
- A compact interface that plugs into the computer's serial port. No power supply is required.
- Color (and B&W) pictures are displayed in real time during reception.
- The vertical-bar on-screen tuning indicator is both an aid and a conversation piece for visitors.
- Automatic receive-mode selection using vertical-interval signal (VIS) coding.
- Automatic fine-tuning of signals that are up to 100 Hz off frequency.
- 320×240-pixel resolution real-time display window with up to 32,768 colors.
- Full-screen VGA captured-image display with 256 colors and two optional dithering modes.
- Full-screen, 32,768-color, VGA captured-image display with appropriately equipped video-display adapters.
- Ability to save images in .GIF, .PCX and Targa file formats.

Hardware Requirements

- IBM PC/AT or compatible with an 80286 or better CPU and 640 kbytes of RAM. (I'd add a hard disk drive to that; the bigger and faster, the better.—*Ed.*); one free serial port; VGA display adapter (for optimum results, cards equipped with a Tseng ET-4000, S3 86C911 or equivalent chip set and HiColor feature are recommended); color monitor. A mouse is recommended, but not absolutely required. And, of course, a receiver tuned to an SSTV station!

[1]Notes appear on page 81.

Figure 1—The Explorer's main menu. The top-left box displays the reception modes. Below that the mode variants of the selected mode are shown. At the far right side is a tuning bar that provides a real-time spectral display of the incoming signal and helps you zero-in on the frequency.

This scenic shot was received off the air with the SSTV Explorer.

print a picture; select automatic reception and received-image saving; quit the program.

• **Edit**—Allows you to manipulate an image: Invert, mirror, rotate (in 90-degree increments), zoom, screen dump, apply noise reduction, remove all color, or filter with a low-pass filter. If you make an error, you can undo the last action (sometimes two actions) taken.

• **Make**—This is basically a test-pattern generation area.

As just briefly described, in the **Edit** menu you can manipulate the picture in several ways. More than likely, you'll find yourself using the noise-reduction feature and low-pass filter more often than anything else. Don't expect miracles; this is not an artist's tool kit. But I think you'll be surprised to see just how much the software can clean up a noisy picture, although the picture's sharpness suffers a bit.

The fastest way to save a picture is to select the AutoSave option. (The program doesn't save parameters when you quit, so you must select AutoSave at the beginning of—or during—each session.) You can save the picture in several formats: .GIF, .HRZ, .PCX and .TGA. (.HRZ is a Robot 1200C version of N9AMR's high-resolution mode.) The fastest save mode is .TGA (that to which **AutoSave** defaults). TGA files also have the largest file size of all (153,618 bytes each—which is also the maximum file size *any* format can have) as well as the most detailed and colorful reproduction of all the file formats. AutoSaved files are given sequential file names starting with SSTV0000.TGA. The program does keep track of the AutoSaved picture numbers, so it will pick up where it left off from day to day.

If you have a video card capable of displaying 32,768 colors (or more), selecting the **32K** button expands the received image to cover the entire screen and puts those colors to work. Not only is the picture easier to view because of its increased size, it loses the "pixelish" appearance it has in the small window. The attractiveness of the image is enhanced tremendously. If you don't yet have a video graphics card capable of 32,768 (or 16.7 million) colors, get one! The number of 32k color cards presently supported by the program is limited to the more popular graphics chips, with expanded support promised in the future. Chances are if you've got one of the commonly available 32k color cards with 1 MB of video memory (such as those using the Tseng ET4000 or S3 Inc 86C911 chips), you'll be set. If not, the program defaults to a 640×480 256-color mode with dithering. This mode requires an SVGA card with at least 512 kbytes of video memory capable of 640×480 256-color display.

The pictures shown here are color originals and reflect the use of a 32k color card. (They look much better in color than as reproduced here in black-and-white.) A minimal radio station configuration was used during reception. That is, no large antennas on high towers, just a transceiver fed by a low dipole (10 feet above ground) or a Cushcraft R7 vertical.

What can you expect? The answer to that question is: It depends on your receiving system (that includes the antenna) and the existing band conditions. Good and poor conditions make for good and poor pictures. Don't expect picture-perfect conditions always, even if you have a big-gun station. There'll be interference, fading, multipath reception, variable propagation conditions and so on. It was the QRM, though, that annoyed me the most: swooshing VFOs, and all too many "tune-ups" and nonsensical CW transmissions within the small range of frequencies used by the SSTVers. You'll have times of S0 signal strength and be amazed by a gorgeous picture—a real keeper—appearing on your screen. When signals are solid S9 or better, you'll probably be in SSTV heaven.

Here's my wish list for the next software version: Inclusion of the AVT 90 mode, increased printer and video-graphics card coverage; file deletion without the need to shell to DOS; automatic saving of the program's last configuration and pull-down menus that hang so it's not necessary to keep the mouse button pressed. According to Radioware, upgraded software will be released by the time you read this. It will be interesting to see what the changes are.

Chances are that after you've had fun with the SSTV Explorer, you'll get the itch to *transmit* pictures, not just receive them. You'll want to get into the picture-swapping and join the friendly SSTV crowd. In that case, I recommend you dig out those back issues of *QST* and *73 Amateur Radio Today*, and do a bit of reading. If you *really* get involved, you could wind up turning your ham shack into a video production studio!

Manufacturer: Radioware, 225 Stedman St, No. 27, Lowell, MA 01851, tel 800-950-9273 or 508-452-5555. Manufacturer's suggested retail price: $49.95.

Notes

[1]C. Pratt and V. Yarbrough, "Pictures by Packet," *QST*, May 1988, pp 15-17.
[2]J. Montalbano, "The ViewPort VGA Color SSTV System," *73 Amateur Radio Today*, Aug 1992, pp 42-44. See also R. Taggart, "A&A Engineering ViewPort VGA Slow-Scan TV System," Product Review, *QST*, Feb 1993, pp 72-74.
[3]R. Taggart, "A New Standard for Amateur Radio Analog Facsimile," *QST*, Feb 1993, pp 31-36.
[4]J. Langner, "Slow-Scan TV—It Isn't Expensive Anymore!," *QST*, Jan 1993, pp 21-30.
[5]B. Vester, "An Inexpensive SSTV System," *QST*, Feb 1994, pp 27-29.