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Collins KWM-380 HF Transceiver

Ten-Tec Argosy HF Transceiver

Product Review

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Collins KWM-380 HF Transceiver

☐ For some amateurs, Collins radio equipment is a ham radio tradition. Over the years, the 75A series receivers, the S-line and the KWM-2 have helped establish Collins's reputation for high quality and performance. The latest Collins entry in the amateur market, the KWM-380, is in many ways different from the previous Collins products, but the Collins tradition is still present. It is a functional rig, incorporating the important operating features without a lot of "bells and whistles."

Receiver

One of the most prominent '380 features is the general-coverage receiver. An upconverting design, with the first i-f near 39 MHz, is used to provide continuous tuning from 1.6 to 30 MHz. There are provisions for five i-f crystal filters, any one of which can be selected independently of the operating mode. Two filters, an 8.0-kHz (a-m) and a 2.1-kHz (ssb) unit, are supplied as standard equipment. Our '380 review unit was equipped with 1.7-kHz, 360-Hz and 140-Hz filter options. There is also an optional 6.0-kHz filter for use in place of the standard 8.0-kHz a-m filter.

A feature most operators will find useful is the passband tuning. It allows the operator to move the receiver passband relative to the received signal (without changing the pitch of the signal). Passband-tuning operation in the '380 is similar to that found in other receivers, except that the passband tuning in the '380 also determines which sideband will be received. The MODE switch controls only the transmitter sideband selection.

Other receiver features include a hang type of agc with selectable decay rate (slow/fast/off) and an optional noise blanker. A built-in *front-panel* speaker is provided, along with headphones and external-speaker connectors. A line output provides an audio take-off that is independent of the AF GAIN control setting. This output is not disabled when headphones are used. Located on the rear panel are connectors for a second receiver (ANT RLY) and a separate receive antenna (RCV IN). Receive modes are usb/lsb, a-m and cw. During cw reception, an active af low-pass filter is switched into the audio chain to limit high-frequency hiss.

An interesting receiver feature is the SPOT button. When this button is pressed, a tone, equal in frequency to the transmit/receive frequency offset, is heard in the headphones or speaker. Tuning the receiver so that a cw signal produces the same frequency as the spot tone places the '380 transmit frequency within a few hertz of the received-signal frequency. The offset used in the '380 is 800 Hz.

Transmitter

The '380 transmitter section is all solid-state, has an output of 100 W (PEP), and provides 160- though 10-m band coverage. Additional frequency coverage is included for the MARS operator. The only transmit modes included in the '380 are cw and ssb. Automatic power turndown protects the solid-state final amplifier from high SWR and excessive key-down time. During cw and RTTY operation, the output is reduced automatically to 50 W after a key-down time of 10 seconds. If the optional blower kit is installed, the full-power key-down time is extended up to one hour. A transmission-line SWR greater than 2:1 also causes an automatic power reduction.

The multifunction panel meter serves as an alc indicator, a forward and reflected power meter, and as a final amplifier dc voltmeter. Other standard features are the front-panel VOX controls and the manual transmit switch. Separate cw and ssb VOX-delay controls eliminate the need to change VOX adjustments when switching modes. Included on the rear panel are connectors for amplifier control and alc lines, a transverter output and an audio line input. An optional speech processor, employing a unique type of audio processing, is available for the '380. In the processor, the audio signal is split into two channels of equal amplitude, but differing in phase by 180°. Each channel is full-wave rectified (without filtering), and then the amplitude of the rectified signals is squared. By summing the two squared signals and taking the square root of the result, a dc signal, equal in amplitude to the peak amplitude of the audio signal, is produced. This dc signal is compared to the preset compression-threshold level to produce an agc voltage. By using this agc voltage to vary the gain of the audio amplifiers, an audio signal of constant *peak* amplitude is produced. The advantages of this patented approach are low harmonic distortion (because clipping is not used) and instantaneous response. All processing is done at af; therefore, mixers and rf filters are not needed.

A combination ac/dc power supply is contained in the '380. The supply can be connected to operate with input voltages ranging from 105- to 250-V ac. Dc operation requires 12 to 15 V at a current of approximately 20 A (3 A during receive). A large, aluminum heat sink is used to cool the power-supply devices and the final amplifier transistors.

Frequency Control

A fully synthesized local oscillator and digital control system perform the tuning functions in the '380. Push-button switches, located directly above the tuning knob, are used to select the desired tuning rate (1 MHz, 1 kHz, 100 Hz or 10 Hz per step). The 1-MHz and 1-kHz per-step rates are used as a "band switch," while normal tuning is done with the 100-Hz and 10-Hz per-step rates. The tuning knob provides 200 steps per revolution in all except the 1-MHz per-step rate. This translates to tuning rates of 2, 20 and 200-kHz per revolution. The 1-MHz per-step rate yields a 10-MHz-per-revolution tuning speed. A LOCK button electrically disables the tuning knob, thus preventing accidental frequency changes. The remaining VFO push button, SYNC, is used in conjunction with the A and B VFO memories.

To provide the equivalent of dual VFOs, the '380 has two VFO memories, or registers. A VFO switch enables the operator to select register A or B to control the VFO frequency. The contents of the selected register are displayed on the seven-digit LED display. Split-frequency operation is also provided. Either register can be selected to control the receive frequency while the other register controls the transmit frequency. The transmit and receive frequencies don't have to be in the same band. It is necessary only that the transmit frequency is in an allowed range. The SYNC button mentioned earlier is used to load the frequency in the selected register (the displayed frequency) into the other register. This can be used to set up the '380 for split-frequency operation, or to use the second register as a frequency memory.

For example, if you want to work a station that is operating "split," you simply tune in the station using, say, VFO A, and then press SYNC. Now the transmit frequency of the other station (your receive frequency) is stored in register B. All that is necessary now is to tune

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to the listening frequency of the station, set the VFO switch to RB-TA (receive B, transmit A), and call the station.

The frequency control story doesn't end with dual VFOs — enter the AC-3803 Control Interface. This '380 option expands on the flexibility offered by the digital VFO. When used with a user-supplied 16-button (two-out-of-eight) keypad, the control interface provides the operator with 11 frequency memories. These memories can be loaded from the selected VFO register (by pressing the ENTer key), or a different frequency can be keyed in and stored without disturbing the current VFO frequency (by using the STOre key). Any stored frequency can be recalled simply by pressing the recall (RCL) key and the desired memory number. A step (STP) key enables the operator to scan the memories manually, automatically skipping any unprogrammed locations. The clear (CLR) key allows you to remove incorrectly entered digits.

Limited operating-frequency information (tens and ones of MHz) is also available at the control-interface connector. This output data is intended for automatic control of external band-switched equipment, such as an amplifier or a Transmatch. The interface also allows the use of a home computer for transceiver frequency control. Although it is pointed out in Collins literature that specific computer programming information is not available, the necessary programs should be straightforward.

Receiver-Circuit Highlights

Amateurs with a curiosity about high-performance receivers will find the design used in the '380 interesting. Collins has applied proven techniques and devices carefully, rather than use radically new approaches to achieve a high level of receiver performance. In fact, the devices and circuits used in the receiver rf, i-f and audio sections will be familiar to most receiver enthusiasts.

Front-end filtering is provided by a combination of a broadcast-band rejection filter, a diode-switched high-pass filter and a 30-MHz low-pass filter. The correct high-pass filter is selected automatically as the operator tunes the receiver. After front-end filtering, the incoming signals are applied to a high-level (+17 dBm LO) diode-ring mixer. Following the mixer is the first i-f amplifier. A U322 JFET is used in the common-gate configuration in this stage. After this stage of amplification, the signals pass through a 4-pole crystal filter and then to a dual-gate MOSFET amplifier. Agc is applied to this amplifier and also to a pin-diode attenuator that proceeds the first mixer.

The noise blanker (optional) is located between the MOSFET amplifier and the second mixer. This mixer is also a diode ring type (+7 dBm LO). In it, the signals are converted to the 455-kHz second i-f. A broadband bipolar amplifier follows the second mixer. Output signals from this amplifier are applied to the passband tuning (PBT) unit. Another pin-diode agc attenuator is used between the PBT section and the last i-f amplifier.

The i-f crystal filters are contained in the PBT unit. Although this assembly is in the 455-kHz second i-f chain, the crystal-filter center frequencies are near 6 MHz. Received signals are heterodyned to the filter frequency, filtered and then converted back to 455 kHz. Use of the same variable oscillator for both conversions allows the passband to be shifted.

On-the-Air Performance

Operating the '380 was a pleasure. The front-panel controls are well-placed and easy to use. Becoming familiar with them took only a short time. Most of the controls are similar to those on other rigs, and their functions are straightforward. Selecting the receive sideband (using the PBT control) and changing bands with the selectable-rate tuning controls took some time to get used to. The control interface and key pad eliminated the latter problem. In fact, all of the control-interface features were very useful.

A "must have" option for dedicated cw ops is a narrow-bandwidth i-f filter. While narrower than the standard 600- or 500-Hz filters supplied for many transceivers, the 360-Hz filter in the '380 seemed optimum for general operating. Under certain conditions, having the option of switching to the very narrow 140-Hz filter greatly increased my operating enjoyment. The excellent frequency stability and the selectable slow-tuning rate of the '380 made using the narrow filter easy. Both cw filters have good skirt selectivity, and the '380 does not suffer from poor ultimate attenuation or "filter blowby."

I found the 1.7-kHz RTTY filter to be useful in fighting QRM during ssb operation. The extra selectivity can be a benefit, and the reduction in voice quality is minimal. Under better conditions, the 2.1-kHz filter provided good selectivity and excellent audio quality.

Having a general-coverage receiver in the shack opened the way to many hours of interesting SWLing and some broadcast-band DXing. While the '380 tuning range is specified as having a lower limit of 1.6 MHz, the receiver does tune to lower frequencies with reduced

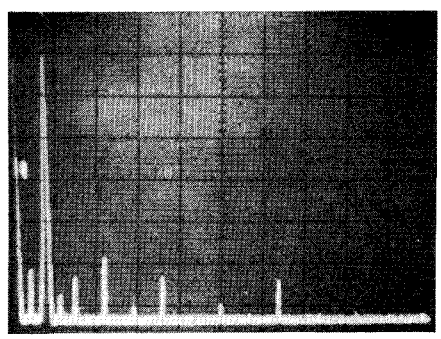


Fig. 1 — Worst-case spectral display of the KWM-380. Vertical divisions are each 10 dB; horizontal divisions are each 10 MHz. Output power is 100 W at 7 MHz. All spurious emissions are at least 58 dB below the fundamental output. The KWM-380 complies with current FCC specifications for spectral purity.

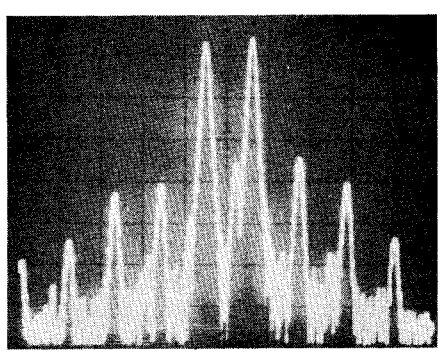
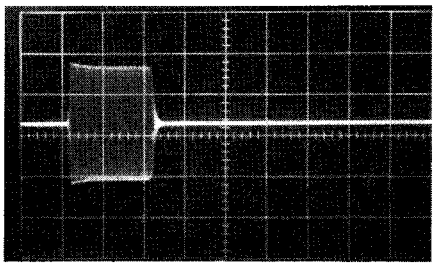


Fig. 2 — Spectral display of the KWM-380 during transmitter two-tone IMD test. Third-order products are 33 dB below PEP output, and the fifth-order products are 40 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The transceiver was being operated at rated output power on the 20-m band.

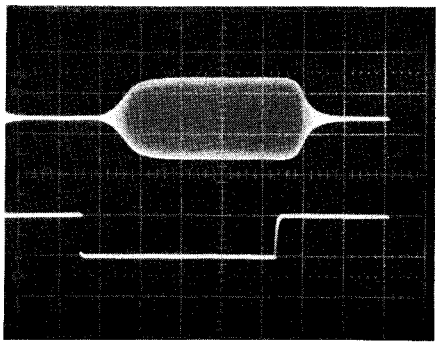
Collins KWM-380 HF Transceiver, Serial No. 1600

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: Receive — 1.6-29.999 MHz in 10-Hz steps; transmit — 1.8-1.999, 3.25-4.25, 6.75-7.55, 10.1-10.149, 13.75-14.6, 18.068-18.169, 20.75-21.7, 24.64-25.239, 27.75-29.949 MHz in 10-Hz steps.	As specified.
Modes of operation: Receive — a-m, ssb, cw; transmit — ssb, cw.	As specified.
Readout: 7 digit.	1/2 inch high, 7-digit red LED.
kHz/turn of knob: Not specified.	10 MHz/200/20/2.
Frequency resolution: 10 Hz.	As specified.
Backlash: Not specified.	Nil.
S-meter sensitivity (μV/S9 reading): Not specified.	160 m, 23; 80 m, 23; 40 m, 23; 30 m, 18; 20 m, 14; 17 m, 28; 15 m, 25; 12 m, 28; 10 m, 25.
Transmitter output: 100-W PEP.	As specified.
Harmonic suppression: Better than 40 dB.	−59 dB (see photo).
Third-order IMD: 31 dB below PEP.	−34 dB (see photo).
Spurious suppression: Better than 50 dB.	Better than 60 dB.
Receiver sensitivity: Less than 0.5 μV for 10-dB S + N/N.	Receiver dynamics measured with optional 360-Hz filter installed.
	80 m / *20 m*
	Noise floor (MDS) dBm: −131 / −131
	Blocking DR (dB): noise limited
	Two-tone 3rd-order IMD DR (dB): noise limited
	Third-order intercept: noise limited
Size (HWD): 6-1/2 × 15-1/2 × 18 inches.†	As specified.
Weight: 48 lb.††	As specified.

†mm = in. × 25.4 ††kg = lb × 0.454.



(A)



(B)

Fig. 3 — KWM-380 cw keying waveforms. First dot sent after VOX switching has a sharper rising edge because of alc setup time. It is also delayed approximately 20 ms, to allow external-amplifier changeover relays to switch and settle (A). The second, and all following dots, show normal rise and fall times of approximately 4 ms, and a delay of approximately 2 ms. This keying waveform should not cause key clicks (B). Horizontal divisions in A are each 20 ms; in B they are 5 ms.

sensitivity. The sensitivity reduction is a result of the broadcast-band roll-off filter used in the receiver front end. This filter is included to protect the receiver from overload by the strong broadcast-band signals found at some locations. It is possible to defeat this filter if a-m broadcast-band reception is desired. The high audio quality of the '380 was evident especially while listening to a-m broadcast stations.

I found the sensitivity of the '380 well suited to amateur-band operation, although some amateurs may prefer a slightly lower noise figure on the higher frequencies.

The weak point in the '380 receiver is the synthesized local oscillator. While it provides excellent frequency stability and tuning versatility, it also provides a relatively high level of LO sideband noise. This made it impossible to measure the IMD and blocking dynamic ranges using the current ARRL lab test methods. This is not a problem unique to the '380; LO noise problems of some degree are found in most synthesized transceivers. The '380 compares well with other synthesized receivers I have listened to. During routine operating, the LO noise is not readily apparent; only when a strong signal was within 10 or 20 kHz of the operating frequency did the effects of the LO noise become noticeable. The '380 LO also appears quite free of the spurs (removed from the LO frequency) found in some receivers.

Transmit performance was smooth and reliable. Reports on the cw and ssb signal quality were good, and the speech processor was effective. The only transmitter "glitch" was observed during cw operation. When the VOX circuit switched from receive to transmit, at the first key closure, an output transient could be seen on the station monitor scope. The transient lasted approximately 1 ms, and the peak amplitude was nearly equal to the normal full output power. It occurred just before the beginning of the normal output envelope. The people at Collins were advised of the problem, and we soon received a diode and instructions for installing it. Apparently, the diode had been omitted when a Service Bulletin modification was installed in the review unit. The keying waveforms shown in the photos were obtained after installation of the missing diode.

The owner's manual supplied with the '380 contains all the information necessary for transceiver operation. It also contains limited service information. The Collins service manual, a nearly 2-inch-thick volume, contains detailed information on how each transceiver section functions, complete parts specifications and numerous fold-out schematic diagrams. The modular construction used in many parts of the '380 should be a benefit if service is required. I was not surprised to find the overall component and construction quality to be high. In terms of reliability and good performance, the KWM-380 should continue the tradition established by the Collins equipment that preceded it. Price class: $4500. — *George Collins, KC1V*

TEN-TEC ARGOSY HF TRANSCEIVER

☐ There is a trend in North America these days toward conservation and simplicity. Many Amateur Radio operators have discovered the joy and satisfaction of low-power (QRP) operation with simple equipment. Some grew tired or bored by the ease of establishing DX QSOs while running their super stations. Others never succumbed to the siren song of the "super snorter, signal-sender" syndrome. If you are one of that number, or if you are looking for a second or standby radio, consider the Ten-Tec Argosy.

Ten-Tec literally started a new era in the history of QRP when they introduced the Argonaut many years ago. This popular rig has ssb, as well as cw capability. Patience is a way of life for the QRPer (required to maintain one's sanity), but sometimes it is desirable to run a bit more power so that a contact can be made quickly and easily. While the Argonaut has only a 5-W input level, the 405 (a companion amplifier to the Argonaut) input level is 100 watts. The pair make a nice combination, but the FCC amplifier rules brought an end to production of the 405 in 1978. Grieve not: The Argosy has come, bringing the choice of low or medium power with it.

Features

A switch on the back panel selects either 10- or 100-W input. By adjusting the DRIVE control on the front panel, lower-power operation is possible. I found the power-select switch easy to operate; with my hand on the right rear of the top cover, my finger found and operated the switch easily.

The Argosy covers the current U.S. and Canadian amateur bands from 3.5 to 30 MHz. In addition, the 10-MHz WARC band is included, making a total of six hf bands in nine 500-kHz segments (four segments for 10 meters). Approximately 40 kHz of overrun is provided by the VFO on each band edge.

The analog frequency readout works quite well. The band-switch position tells the MHz increments. A linear scale with a lighted, red bar pointer (LED) indicates the hundreds of kHz. The kHz figures are read from the tuning-knob skirt; calibration is 1 kHz per division. Band changes are a dream with this all solid-state radio. There are no receiver front-end or final amplifier adjustments to make; just switch bands, change antennas, dial the desired frequency, and then transmit (after listening first, of course). Even the sideband selection is automatic.

The front panel is clean and well laid out. The mode switch is located in the upper left corner; it has positions for sideband-normal (SB-N), reverse (SB-R), CW and LOCK. On the right side are the receiver OFFSET (RIT), the i-f NOTCH filter, the receiver AF-POWER and the transmitter DRIVE controls. Three push buttons are on the left panel switch: the wattmeter/SWR meter from FWD to REV, the optional noise blanker ON/OFF and the optional calibrator ON/OFF. Another set of three push buttons, these located in the lower right portion, control selectivity. One switches an optional i-f filter IN/OUT. (There are four optional crystal ladder filters available — 2.4- and 1.8-kHz 8-pole filters for SSB, and 500-Hz (8-pole) and 250-Hz (6-pole) for cw.) Two other switches are used for the optional audio cw filter — one for IN/OUT, the other for bandwidth. Position ONE is 450-Hz bandwidth; position TWO is 150 Hz. Center frequency is 750 Hz. A pair of 1/4-in. phone jacks[1] are used for connecting a microphone and a pair of headphones.

On the rear panel, located below the HIGH/LOW power switch, is the SO-239 antenna connector. On the other side of the rear panel is the four-pin power connector and ground post. Above these there are six phono jacks; they are for: KEY, +12-V dc, AUX and three SPARES.

Operation

Full break-in (QSK) cw and push-to-talk

[1]mm = in. × 25.4; kg = lb × 0.454.

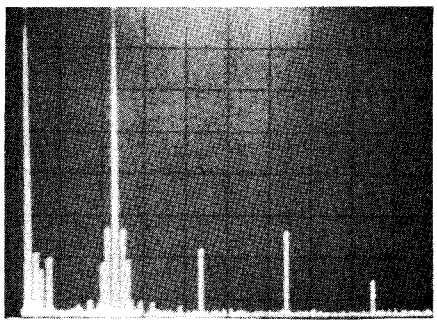


Fig. 4 — Spectral display of the Ten-Tec Argosy. Vertical divisions are each 10 dB; horizontal divisions are each 10 MHz. Output power is approximately 5 watts at 15 meters. The worst-case spurious emission is approximately 53 dB down from the fundamental.

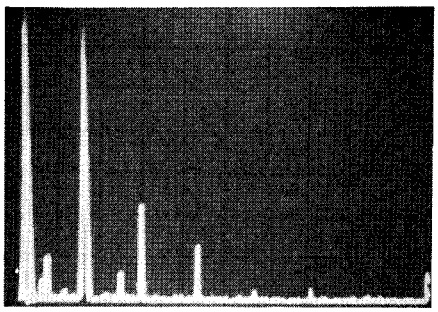


Fig. 5 — Spectral display of the Argosy. Vertical divisions are each 10 dB; horizontal divisions are each 10 MHz. Output power is approximately 40 watts at 20 meters. The worst-case spurious emission is approximately 48 dB down from the fundamental. The Argosy complies with current FCC specifications for spectral purity.

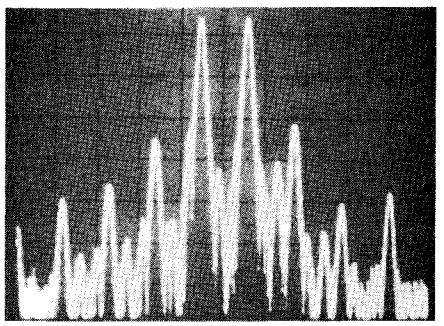


Fig. 6 — Spectral display of the Argosy during transmitter two-tone third-order IMD test. The third-order products are approximately 31 dB below PEP, and fifth-order products are about 46 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The transmitter was being operated at 100 watts of input power on the 20-meter band.

Ten-Tec Argosy HF Transceiver, Serial No. 00026

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 3.5 to 30 MHz, including 10 MHz.	As specified, plus a minimum of 40 kHz additional at each band edge.
Modes of operation: Ssb, cw.	As specified.
Frequency display: Analog dial.	As specified.
Resolution: 1 kHz.	As specified.
kHz/turn of tuning knob: 18.	18.
Backlash: Not specified.	Nil.
RIT range: ±3 kHz.	±3 kHz.
Audio power output: 1 watt (8 ohms).	As specified.
Power consumption: Transmit, 122 watts; receive, 6.75 watts.	Not measured.
Transmitter rf-power output: 40-50 watts in high-power position; 4-5 watts in low-power position.	As specified.
Spurious suppression: Better than 45 dB.	54 dB worst case (5 W out); 60 dB worst case (40 W out).
Harmonic suppression: Better than 45 dB.	48 dB.
Carrier suppression: Better than 40 dB.	68 dB.
Transmitter third-order IMD: Not specified.	31 dB below PEP (see photo).
Frequency stability: Less than 20-Hz change per °F, averaged over a 40° change from 70° to 110° after a 30-minute warmup. Less than 15-Hz change from 105- to 125- V ac when using a Ten-Tec power supply.	620 Hz from cold start to one hour later.
S-meter sensitivity (μV/S9: Not specified.	Ranging from 21 to 27 μV.
Receiver sensitivity: 0.3 μV for 10 dB S + N/N typical.	Receiver dynamics measured with model 217 500-Hz i-f filter:

	80 m	*20 m*
MDS (dBm)	−133	−133
Blocking DR (dB)	99	98
Two-tone third-order IMD DR (dB)	64	64

Size (HWD): 4 × 9.5 × 12 in.
Weight: 8 lb.
Color: Gray.

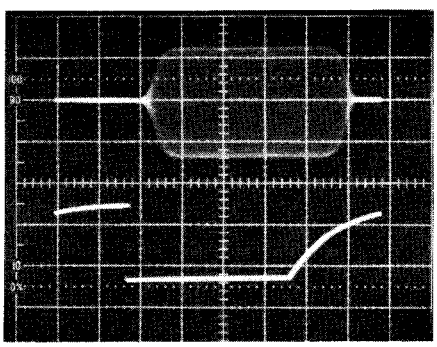


Fig. 7 — Cw keying waveform of the Argosy. Upper trace is the rf envelope; lower trace is the dc level at the key jack. Each horizontal division is 5 ms. The carrier level was adjusted until the alc indicator LED just showed full brilliance. Higher amounts of drive tend to sharpen the wavefront.

(PTT) operation on ssb are standard features of the Argosy. The built-in cw sidetone can be adjusted in pitch and volume to suit individual preference. To operate high power (100-W input), set the HI/LO switch to HI, and the mode switch to LOCK. Increase drive until the red ALC LED lights fully. Return the mode switch to the desired position and you are ready to transmit.

One of my first QSOs using the Argosy was with HZ1AB on 7-MHz cw. Later, while running QRP on the higher bands, many countries were contacted, including 3B8 and 9K2. I have used it in several contests with satisfactory results. Only the agc disappointed me. When the background noise level is low and signal levels are high, the first code element or voice syllable comes through with a loud "pop." This is caused by a too-slow agc attack time — a result of audio-derived agc. Most of the time this is no problem, but it can be particularly bothersome if one is wearing headphones. An rf gain control would help.

The second time the Argosy was turned on, the protective circuitry immediately shut it off. I turned the rig off and back on, and everything was fine. It still does that occasionally, but I find it no particular problem.

Output from the optional calibrator is pulsed. That makes it a lot easier to identify. I found that particularly useful amid the cacophony of the 40-meter band.

Clean audio characterizes the receive and transmit modes. Cw reception is enhanced by the addition of the 500-Hz i-f and audio cw filters. Yes, the Argosy has the stability to go with that kind of selectivity.

W1FB put the Argosy through its paces during a two-week "hamcation" on Barbados in April of 1982, operating 8P6EU. The transceiver performed admirably with sloping dipoles over the seashore. Worldwide DX contacts yielded reports ranging from RST 559 to 599.

Owing to the 85 to 95° F temperatures that prevailed during the daylight hours, and because of the 50-Hz line current on the island, the power transformer overheated. Operating with the top cover of the power-supply case removed solved the problem.

W1CKK, operating as 8P6FJ, had good results while using the unit on ssb. Reports indicated that the phone and cw signals from the Argosy were very clean — excellent audio quality and nice cw-note shaping. Certainly the transceiver is sized ideally for travel by airplane, and the weight is light with respect to comparable rigs.

You can buy the basic transceiver today and add the options later, if you desire. The optional features all mount easily inside the compact, metal cabinet. The Argosy is available from Ten-Tec, Inc., Sevierville, TN 37862. Price class: Argosy, $549; 225 power supply, $129; 226 calibrator, $39; 217 500-Hz filter, $55; 220 2.4-kHz filter, $55; 223 noise blanker, $34; 224 audio cw filter, $34. — *Chuck Hutchinson, K8CH*