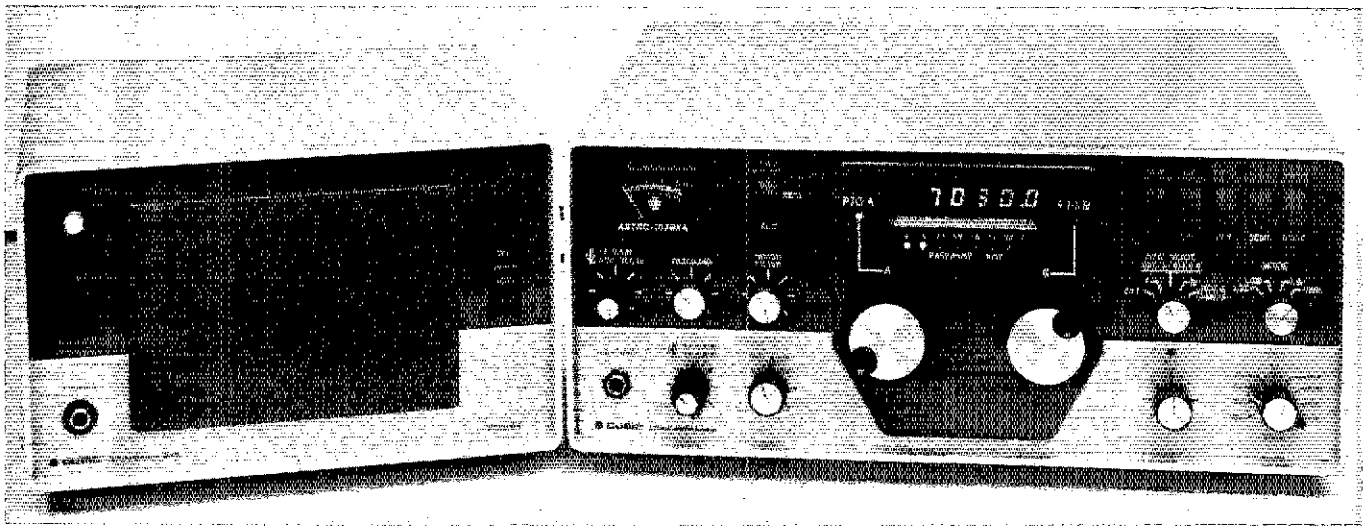
Product Review

Conducted By Paul K. Pagel,* N1FB

Cubic Astro 102BXA Transceiver



American made? Yes, indeed! The Astro 102BXA (formerly Swan/Astro) is built by a tenured engineering firm, Cubic Corporation, of Oceanside, California. The manufacturer once stated that "75 of our engineers were involved in the design of the Astro." Those who subscribe to the "buy American" doctrine should be pleased with this product.

If your buying urge is stimulated by the presence of dazzling geegaws, this rig may not be for you. But if truly functional and important operating features inspire you, the 102BXA might be what you've been waiting for. It has what the operator needs, and nothing more.

Coverage is from 160 through 10 meters in six bands. This transceiver is completely transistorized (inclusive of ICs and diodes). Twin PTOs are included to provide split-band operation when desired. Other features are variable age time constant, passband tuning, and separate controls for rf and i-f gain. It also has RIT, selectable break-in delay or full QSK, noise blanker and speech processor. The panel meter indicates forward and reflected power in watts, alc level and the relative strength of incoming signals.

A large red digital display provides readout of the operating frequency to six places, such as 21,025.3 kHz. An eight-level LED string shows the status of the passband tuning from 0.6 to 2.7 kHz. There is also a notch filter that is adjustable from the front panel of the transceiver.

The passband-tuning control sets the i-f bandwidth with either a high-pass or low-pass cutoff. Clockwise rotation of the control attenuates low-frequency audio, while counterclockwise rotation reduces the high-frequency response. The LEDs mentioned earlier indicate the effective audio passband of the receiver. I learned that the control needs to be set for approximately 1.0 kHz or higher when the sharp cw accessory filter (300 Hz) is being used. Otherwise, no cw beat note is heard.

The microphone impedance is specified as 47,000 ohms. A key jack is located on the rear panel of the transceiver, but the PTT line (accessible at the mike jack) can also be used as a keying-control line.

Other connection points on the rear apron of the equipment are EXT RELAY, EXT MODULATION, EXT LO, ANTENNA, GND and EXT SPEAKER. There is a built-in speaker, plus provision for an external one. The EXT MODULATION jack provides an interface for AFSK, and the MIC GAIN control on the front panel is used in that mode to control the level.

The speech-processor action is determined automatically by the setting of the MIC GAIN. There is no separate external adjustment for the processor. Similarly, the noise blanker is factory-adjusted. It has no external threshold control. Carrier-level control during cw operation is provided by the MIC GAIN control.

I am mystified by the presence of a SOFT/HARD keying switch on the transceiver front panel. The keying waveform in the "hard" position is what we at ARRL consider objectionable in terms of clicks (see Fig. 3). The "soft" position yields an excellent waveform, closely approaching the desired 5-ms rise and fall times that result in click-free keying. That panel switch might have been put to better use as a CARRIER LOCK control, which has not been included in the design. This makes tune-up difficult unless the keyer has a "carrier hold" switch.

Other features that aren't present in the Astro 102BXA are a crystal calibrator or WWV band-switch position. Fortunately, the 40-meter coverage is from 7.0 to 7.5 MHz, which permits reception of Canada's CHU time/standard station in some areas of the country.

The internal switching feature for an external amplifier is compatible with the manufacturer's Astro 1200Z and 1500Z amplifiers. Unfortunately, the internal solid-state switching circuit is limited to a maximum of +200 V and 200 mA. Therefore, most amplifiers of different manufacture can't be switched by the Astro 102BXA — at least not directly. I had to interface the transceiver with my Heath SB-221 by means of an external relay that was actuated by the solid-state switch in the Astro. A 12-V dc relay can be used (low-current coil), and power for it can be borrowed from the +12-V bus in the transceiver. If an external relay is used, it will negate the use of full QSK since many control relays will not follow the cw speeds that are used by most operators.

I was impressed with the skirt selectivity of the i-f system. The variable passband tuning of the receiver complements the i-f filters to reduce wideband noise and enhance the effective selectivity. In fact, acceptable cw selectivity can be had when using the ssb i-f filter by ad-

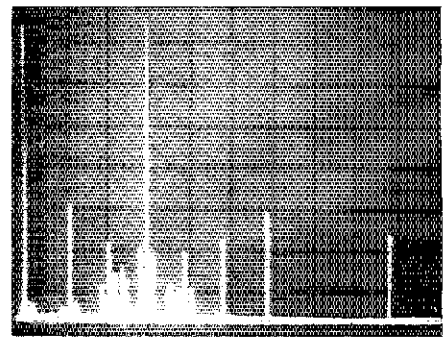


Fig. 1 — Worst-case spectral display of the Cubic Astro 102BXA. Vertical divisions are each 10 dB; horizontal divisions are each 10 MHz. Output power is approximately 100 watts at a frequency of 28 MHz. Spurious emissions are at least 49 dB down from peak fundamental output. The Astro 102BXA complies with current FCC specifications for spectral purity.

*Assistant Technical Editor

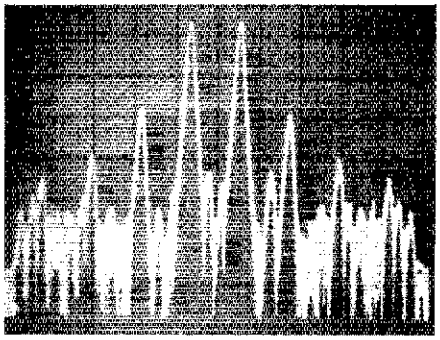


Fig. 2 — Spectral display of the Astro 102BXA output during transmitter two-tone IMD test. Third-order products are 28 dB below PEP, and fifth-order products are 39 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The transceiver was being operated at rated input power on 14 MHz.

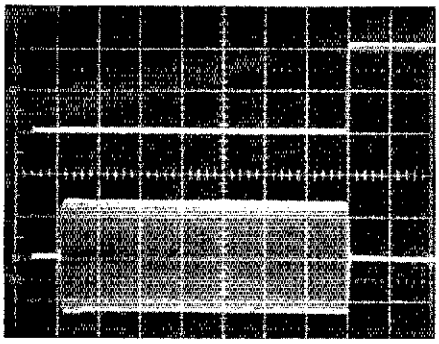


Fig. 3 — Cw keying waveform of the Astro 102 with the selection switch in the "hard" keying position. The upper trace is the actual key closure; lower trace is the rf output envelope. Each horizontal division is 5 ms. This waveform will generate key clicks.

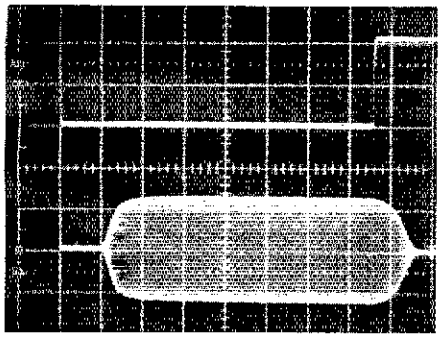


Fig. 4 — Cw keying waveform of the Astro 102 with the selection switch in the "soft" keying position. The upper trace is the actual key closure; lower trace is the rf output envelope. Each horizontal division is 5 ms. This waveform is essentially click-free.

justing the variable passband control to the counterclockwise end of its range.

Cw offset is 800 Hz. In the sharp cw mode (300-Hz accessory filter installed), the cw filter is operated in series with one of the two 8-pole ssb filters. This greatly reduces wideband noise from the i-f amplifiers and provides an apparent improvement in overall receiver signal-to-noise ratio. During ssb operation the two 8-pole filters are in use. The ssb filters have a bandwidth of 2.4 kHz, and the shape factor is 1.4, referenced to the 6- and 100-dB points on the response curve.

Cubic Astro 102BXA HF Transceiver Serial No. 659

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 160, 80, 40, 20, 15, 10 meters.	As specified, plus additional coverage above and below each band: 1378-2106 kHz; 3379-4106 kHz; 6879-7606 kHz; 13,878-14,606 kHz; 20,878-21,606 kHz; 27,878-30,106 kHz.
Operating modes: Cw and ssb.	As stated.
Readout: Digital (red LEDs).	
Resolution: 100 Hz.	25 kHz per 360° turn of tuning knob.
Backlash: Not specified.	Nil.
Power requirements: 12-14 volts dc, negative ground, 20-A peak.	As stated.
Transmitter rf power output: 100-W PEP into 50-ohm load at 13.5 V dc.	80/40 m = 125 W; 20/15 m = 108 W; 10 m = 100 W.
Transmitter third-order IMD: Not specified.	Approximately −28 dB (worst case) on 20 m (see photo).
Spurious suppression: 55 dB below peak power.	Approximately 49 dB (worst case), 10 m (see photo).
Harmonic suppression: 45 dB below peak power.	Approximately 50 dB (worst case), 10 m (see photo).
Frequency stability: Not specified.	80 Hz from cold start to one hour later.
Receiver audio output power: Greater than 3 W into a 4-ohm load.	Not measured.
RIT range: Not specified.	±1 kHz.
S-meter sensitivity (μV/S9): Not specified.	160 m = 85; 80 m = 65; 40 m = 55; 20 m = 50; 15 m = 50; 10 m = 75.
Receiver sensitivity: 10 dB S + N/N, 0.35 μV typ.	Receiver dynamics measured with optional 300-Hz crystal filter installed:

	80 m	*20 m*
Noise floor (MDS) dBm:	−125	−129
Blocking DR (dB):	*	*
Two-tone, third-order: IMD DR (dB):	90	84
Third-order input intercept (dBm):	−10	−3

Size (HWD): 6-3/8 × 14-1/4 × 13-1/4 in.
Weight: 23-1/2 lb.
Color: Not specified.
'mm = in. × 25.4, kg = lb × 0.454.

*unmeasured — noise limited.

Other Features

The transmitter is rated at 100 watts output for peak ssb and cw. Power output is limited to this level by the alc circuit. Available output power is 100% of this amount with VSWR values up to 1.7:1 at 50 ohms. It drops to 60% when the VSWR is 3:1. During an open or short condition the factor is 25% (equivalent voltage). A built-in VSWR sensor causes the foregoing shutdown power amounts to protect the PA transistors from damage.

Mobile operation is possible from the automotive dc-voltage system. The safe operating range is specified as 10 to 15 volts dc. Apart from the fairly large dimensions of the Astro 102, it is well suited to mobile use because it employs broadband tuning in the receiver and transmitter sections. Only minor adjustments are necessary when changing bands. The receiver is a single-conversion type with a 9-MHz i-f. Five weak birdies were noted in the receiver tuning range.

Those wishing to have full RTTY capability, plus inclusion of the WARC-sanctioned 10-, 18- and 24-MHz amateur bands, may want to consider purchasing the Astro 103BXA transceiver. The 102 and 103 models are otherwise identical. Price class: $1200. Manufactured by Cubic Communications, Inc., 305 Airport Rd., Oceanside, CA 92054. — *Doug DeMaw, W1FB*

KENWOOD TR-9000 MULTIMODE 144-MHz TRANSCEIVER

☐ If you read the survey article in March 1981 *QST*[1] carefully, you may have been surprised to learn how much activity was reported on "vhf/uhf, a-m/cw/ssb." Of the survey respondents active in Amateur Radio, 18% said they averaged at least an hour of such activity per week. For comparison with other vhf/uhf figures, the percentage for fm was 48%, for "other modes" 3% and for satellite communications (where cw and ssb are also used), 2%. Numbers like that make it easy to understand why new vhf transceivers with multimode capability keep popping up in the marketplace. (Less easy to understand is why Japanese manufacturers have totally dominated this particular market, but that's another story.) Not surprisingly, 2 meters has been the most popular band for the vhf multimode rigs, as it has been for fm rigs.

In the past, these multimode transceivers generally could be characterized in two ways: whether they were designed primarily for fm or for ssb, and whether they were designed primarily with fixed station or mobile operation in mind. If a rig is intended mainly for ssb, it will give the operator a "feel" very similar to a conventional high-frequency transceiver; if for fm, it will have the features you have come to look for in a sophisticated fm rig — ease of selection of the most frequently used channels,

[1]D. Sumner, "Survey of Amateur Radio, 1980," *QST*, March 1981, pp. 11-18.