

Communications Systems Digitally Synthesized RADIO RECEIVER



TMC
Technical
Bulletin

103013



model 3020A

The Marine receiver Model 3020A is a rugged, state-of-the art, highly stable, maritime and general purpose radio receiver. It is a completely solid state, dual conversion, super-hydrodyne design providing continuous frequency coverage from 15kHz to 29.9999 MHz. Frequency selection is accomplished by a digitally controlled synthesizer.

The frequency synthesizer utilizes the most modern approach for generating required injection frequencies while remaining within the technology of recently developed components and proven techniques. Maximum use is made of integrated circuits to maximize reliability and assure a high degree of maintainability.

The receiver is designed with a minimum of trim components with easily replaceable printed circuit boards, thereby assuring minimum service time and cost.

Technical Specifications MARINE RECEIVER MODEL 3020A

Frequency Range

15KHz to 29.9999 MHz. Full sensitivity specifications from 100 KHz to 29.9999 MHz. Sensitivity is reduced uniformly between 100 KHz and 15 KHz by approximately 10 dB at 15 KHz.

Modes of Operation

Upper sideband (USB), lower sideband (LSB), amplitude modulation (AM), continuous wave (CW), radio teletype (RTTY) and facsimile (FAX).

Frequency Selection

Digital, 299,850 channels in 100 Hz steps. Fine tune between 100 Hz steps.

Frequency Stability

Frequency drift does not exceed 1 Hz per MHz of tuned frequency over a temperature range of 0° to 50°C., and 1 Hz per MHz of tuned frequency per year after calibration of internal frequency standard.

Blocking

The receiver output due to a wanted signal of 500 microvolts changes less than 3 dB when an unwanted signal of 50 millivolts at least 10 kHz removed is applied.

Sensitivity IF Band Width	Max. Applied Input for	
	10 dB	$\frac{S+N}{N}$ SSB/CW
8 kHz	0.8 microvolt	
2 kHz	0.4 microvolt	
1 kHz	0.3 microvolt	
0.4 kHz	0.3 microvolt	
SSB	0.4 microvolt	

Image Rejection > 70 dB IF Rejection > 70 dB

Sideband Suppression

Greater than 60 dB at 500 Hz into the unwanted sideband.

Cross Modulation

With a wanted signal of 1 millivolt EMF, an unwanted signal of 10 millivolts 30%, 400 Hz modulation and separated 10 kHz or more, produces an output at least 30 dB below output level due to the wanted signal.

IF Bandwidth

Switch Position	6 dB down	60 dB down
8 KHz	8 KHz min.	20 KHz max.
2 KHz	2 KHz min.	12 KHz max.
1 KHz	1 KHz min.	6 KHz max.
0.4 KHz	0.4 KHz max.	4 KHz max.
USB	+350 Hz to +2700 Hz	≤ -500 Hz and $\leq +3800$ Hz
LSB	-350 Hz to -2700 Hz	$\leq +500$ Hz and ≤ -3800 Hz

Automatic Gain Control

Output rise 2 dB max. for input from 3 microvolts to 100,000 microvolts. Output rises 11 dB max. for input from 1 microvolt to 100,000 microvolts.

AGC

	Slow	Fast
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Attack Time	≤ 10 milliseconds	≤ 10 milliseconds
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Release Time	2 seconds (nominal)	150 ms (nominal)
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Input Impedance	.015 to 29.9999 MHz	50 Ω with pre-selector in wide-band position.
	100 KHz to 4 MHz	Preselector matches receiver input to typical electrically short antennas.
	4 to 30 MHz	50 Ω with pre-selector in tuned positions.

Audio Output	3.2 Ω	1 Watt at 5% max. distortion (internal or external speaker)
	600 Ω	+ 10 dBm Max.

Primary Power

115/230 + 15% single phase 50/60 Hz

Power Requirements

80 watts at full audio output level

Temperature, Operational

0 to 50°C

Humidity

to 95%

Size

5¼" H x 19" W x 17" D 13.34 cm H x 48.26 cm
W x 43 cm D

Weight

30 pounds 13.6 Kg.

Controls

All controls required for the operation of the 3020A Receiver are mounted on the front panel.

Frequency Selection

Selects receiver tuned frequency in MHz. Consists of six lever-controlled decades, each decade having the digits 0 thru 9, except the most significant decade, which contains only the digits 0, 1 and 2.

(Specifications subject to change without notice.)

RF Input/Audio Output Meter Display Switch

Toggle switch which selects either audio or RF signal strength indication on the front panel meter. The audio display is derived from the rectified audio output, while the RF level indicator is derived from the AGC DC control voltage.

Audio Gain/Power On-Off

Potentiometer which controls audio volume and switches AC power on/off.

Speaker On/Off Switch

Toggle switch which is used to silence speaker.

RF Gain Control/AGC On Switch

Potentiometer which manually adjusts the 92 MHz amplifier gain and the 8 MHz IF amplifiers gain. Also switches the AGC on when the knob is fully counter-clockwise (switched).

Preselector Range Switch and Tuning

The outer control is a ten-position switch which selects the appropriate tuned frequency range. The inner, variable control provides preselector tuning and is used in conjunction with the RF meter to peak the received input signal.

Antenna Attenuator In/Out

Toggle switch connects and approximately 20 dB pad in receiver front end.

Fine Tune

Potentiometer varies tuning approximately ± 100 Hz about dialed frequency.

Mode

Four interlocking pushbutton switches select AM, CW, USB or LSB. In AM position, the AM detector circuitry is enabled, while the product detector circuitry and the product detector injection are disabled. In the CW, USB or LSB positions the reverse is the case.

IF Bandwidth

Four interlocking pushbutton switches select IF bandwidth of 8 KHz, 2 KHz, 1 KHz, 0.4 KHz. These switches are automatically disabled when USB or LSB is selected.

AGC Fast/Slow

Toggle switch selects fast or slow AGC release time. Normally fast AGC is utilized for CW signals and slow AGC for SSB signals.

CW Pitch

Toggle switch selects either fixed or variable frequency product detector injection. For CW operation the variable frequency crystal oscillator is utilized for operator pitch control by the associated "variable" knob. The tuning range is approximately 1 KHz. In the fixed position the product detector injection is provided by the frequency standard and produces zero beat when the incoming CW signal is precisely at the frequency of the frequency select switch.

Phones

The Phone jack connects to the 3 Ω audio output.

Supplied under agreement with ITT Mackay.

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