

Product Review

KM3KM Electronics Mercury LUX Solid-State 160- to 6-Meter Linear Amplifier

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The Mercury LUX from KM3KM Electronics builds on the success of the popular Mercury IIIS, which was originally available as a kit. The Mercury LUX covers 160 through 6 meters and is rated at 1500 W SSB/CW output on most bands (1350 W on 17 and 12 meters, 900 W on 6 meters). The maximum output for digital modes such as FT8 is 800 W, with a maximum 1-minute transmission followed by 15 seconds of receiving.

Compared to the Mercury IIIS, the Mercury LUX offers increased power output, computer-aided transceiver (CAT) control options with popular radios, remote operation with PC control software, and an expanded user interface. Neither amplifier supports full break-in (QSK) CW operation. The optional Mercury ATS automatic antenna tuner works with either amplifier.

The Mercury LUX amplifier is manufactured, shipped, and supported from KM3KM's facility in Florida. In past years there was a long waiting list (up to a year) for KM3KM amplifiers, but as I write this, Mercury LUX amplifiers are generally in stock or available after a short lead time. Check the KM3KM website (www.km3km.com) for the current status.

Documentation and Support

KM3KM does not supply a printed manual for the Mercury LUX, but an 18-page PDF manual is available online. The well-illustrated manual includes an overview of the amplifier with some tips for successful high-power operation, features and specifications, a Quick Start guide, tours of the front-panel main screen and rear-panel connections and adjustments, PC remote control, and band data interface cables.

Bottom Line

Compact, quiet, and lightweight, the KM3KM Mercury LUX is easy to set up and use. It offers legal-limit power on SSB and CW on most bands from 160 through 10 meters, with reduced power ratings for 17, 12, and 6 meters and for data modes such as FT8.



KM3KM has published several firmware updates for the Mercury LUX, and the latest version is available online. Updates are performed using a 64-bit Windows computer connected to the USB port on the amplifier's rear panel. The firmware update package includes the firmware update file, *TyLoader* software that runs on the PC to upload the firmware file to the amplifier, and instructions.

In addition to the firmware update package, the Downloads section of KM3KM's website includes the PC control software and the amplifier instruction manual in PDF format. Support is available from KM3KM via the website and through a very active KM3KM Mercury User Forum on Facebook.

Overview

The Mercury LUX is compact and weighs about 29 pounds, so it is very easy to handle and move around the station. You can add optional black, aluminum, or chrome handles to the front of the cabinet. Also optional is a set of feet to tilt the front panel up. The review amplifier uses a pair of BLF188 LDMOS devices, but that has been changed to a pair of ART1K6FHU LDMOS devices in current production.

The Mercury LUX operates from 120 or 240 V ac. Maximum power output is 1200 W with a 120 V, 20 A ac line. Full power is available with a 240 V, 10 A ac line. The power supply automatically adjusts for 100 to 240 V operation without any jumpers or menu settings.

Table 1 — KM3KM Mercury LUX Linear Amplifier

Manufacturer's Specifications	Measured in the ARRL Lab					
Transmitter	Transmitter Dynamic Testing					
Frequency coverage: 1.8 – 54 MHz (amateur frequencies only).	As specified.					
Power output: 1500 W (1200 W with 120 V ac supply) CW/SSB mode, except 1350 W on 18 and 24 MHz and 950 W on 50 MHz; 800 W continuous carrier modes (AM/FM/RTTY/data).	As specified, except 1300 W on 1.8 and 1200 W on 18 MHz.					
Driving power: CW/SSB, 50 W typical, 60 W max; RTTY/AM/FM/data, 20 W max.	HF, 20 – 30 W typical, except 50 – 55 W on 1.8, 3.5, 18, and 50 MHz.					
Spurious signal and harmonic suppression: Not specified.	Typically > 60 dB, except 52 dB on 24 and 28 MHz; complies with FCC emissions requirements.					
Third-order IMD products: > 30 dB below PEP power of carrier.		3rd	5th	7th	9th	Order
	14 MHz (1500 W)	–26	–37	–50	–62	dBc
	50 MHz (1000 W)	–20	–29	–45	–47	dBc
Relay transition time: 9 ms transmit delay, 3 ms receive delay.	PTT close to transmit, 39.2 ms. PTT open to receive, 49.2 ms.					
Primary requirements: 120 V ac (20 A) or 240 V ac (10 A).						
Size (height, width, depth, not including protrusions): 5.5 × 11 × 13.5 inches.						
Weight: 29 pounds.						

No ac line cord is supplied with the Mercury LUX. The amplifier requires a cable with an IEC320 C13 connector on the amplifier end, which is very common on desktop computers and other consumer electronics. I found a 6-foot, 14 AWG cable rated for 250 V at 15 A online for about \$13. (I searched for “NEMA 6-20P to IEC320 C13” to match the 240 V outlet in my station and found quite a few options.) While awaiting delivery of the 240 V cable, I used the Mercury LUX on 120 V at reduced power with a compatible power cord I had on hand. If you want to run the Mercury LUX from 120 V, confirm that the wire size is adequate, as many computers or other 120 V consumer devices with IEC320 C13 power cords use 16 or 18 AWG wire.



Figure 1 — A 7-inch high-resolution color touchscreen dominates the front panel. All monitoring and control, except for the power switch, are handled on-screen.

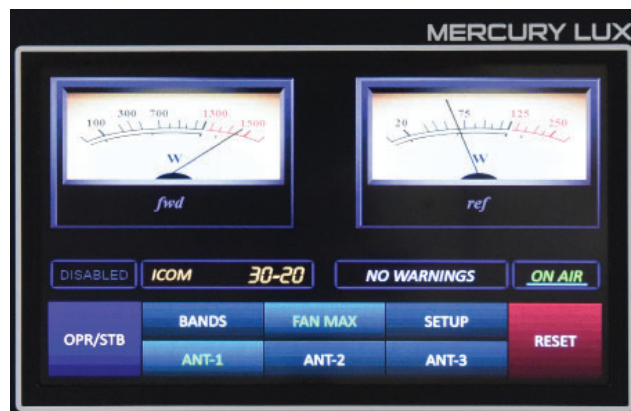


Figure 2 — Simulated analog meters are featured on this alternate screen layout.

Display

Other than the power switch, there are no physical controls on the front panel. A 7-inch color touchscreen (see Figure 1) is used for all monitoring and control functions. Bar graphs and numerical displays in the top portion of the screen show forward and reflected power, drain current and voltage, and temperature. You can choose Celsius or Fahrenheit using the **DISPLAY SETTINGS** menu on the **SETUP** screen. Below the bar graphs are displays for SWR, current band selection, band data source (a CAT interface or RF sensing), and protection warnings. The **ON AIR** indicator lights when the Mercury LUX switches to transmit. Unlike some amplifiers, the SWR and power metering does not function with the amplifier in standby.

Touch-sensitive on-screen buttons along the bottom of the screen switch between operate and standby, manually select among three antennas, toggle the fan speed, access the **SETUP** screen, and reset the amplifier in the event of a protection warning. Touching the **BANDS** button changes the lower display to show touch-sensitive buttons for manual selection of the operating band, along with an **AUTO** choice for automatic band selection (more on this later).

From the **SETUP** menu, you can add your call sign to the upper right corner. The call sign scrolls horizontally if you touch the screen in that area.



Figure 3 — The Mercury LUX rear panel.

Touching the screen between the forward and reflected power bars changes it to a simulated analog meter display (see Figure 2). Although I liked the look of the analog meters, the simulated meter needles moved very quickly and could use some simulated damping.

Display brightness is adjustable. A **SLEEP** selection in the **DISPLAY SETTINGS** menu turns off the screen after 15 minutes of inactivity. Touch the screen or transmit to restore the screen display.

Setup

Figure 3 shows the rear panel. The big switch in the lower left corner above the ac power jack removes all power from the amplifier. There are SO-239 connectors for the transceiver and three antennas. Transmit/receive (TR) relay control from your transceiver connects to the **PTT** phono jack. The **BAND DATA** jack is for a transceiver CAT connection. You can make your own cable using a pinout chart and diagrams for interfacing various transceiver brands in the manual, or you can buy a cable assembled and tested from KM3KM's website. The **REMOTE** jack provides high/low output signals for control of external accessories.

The **ALC** phono jack is for automatic-level control connection to the transceiver. Using this feature requires a simple adjustment process with the **ALC ADJ.** screw. The Mercury LUX drive requirements vary from band to band, and using the ALC connection helps to reduce the risk of accidentally overdriving the amplifier.

Figure 4 shows the **SETUP** screen, which is divided into sections for **DISPLAY SETTINGS**, **RADIO BAND DATA**, and **ANTENNA MEMORY**. The **RADIO BAND DATA** menu offers several options for automatic band selection when **AUTO** is selected from the main screen **BANDS** button. The **RF DECODER** choice allows operation with any transceiver, and I found that it worked great with my Kenwood TS-590S. The amplifier measures the input frequency and switches to the appropriate band

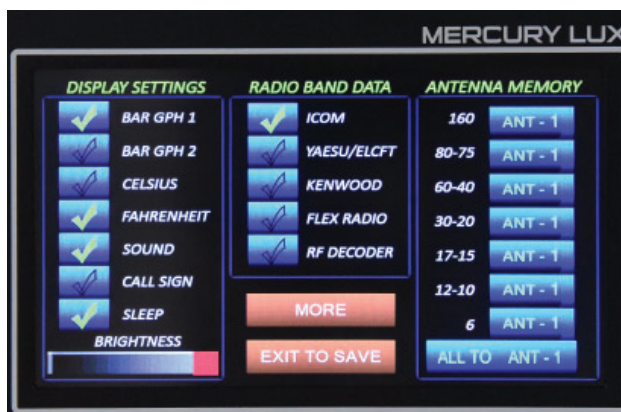


Figure 4 — Pressing the **SETUP** button brings up this screen with display settings, band data options for various transceiver brands, and antenna port mapping options.

instantly when you transmit with as little as 200 mW. Speaking a syllable on voice or sending a dit on CW is all that's required.

The other **RADIO BAND DATA** menu choices are for a CAT interface with transceivers from Elecraft, FlexRadio, Icom, Kenwood, and Yaesu via the rear-panel **BAND DATA** jack. I purchased an interface cable for my Icom IC-7300 from the KM3KM website and selected **ICOM** from the menu. It worked fine with no further settings or adjustments, following every band change on the IC-7300. If the CAT interface fails or is disconnected, RF sensing takes over to avoid damage to the amplifier.

Three antenna jacks on the rear panel can be selected manually using the corresponding touch-sensitive buttons on the display, or they can be mapped to the various bands using the **ANTENNA MEMORY** menu. I connected my multi-band beam for 20 through 6 meters to **ANT-1** and my 40-meter dipole to **ANT-2**. I use a manual antenna tuner with a 130-foot dipole fed with window line for 80 meters, and I connected the manual tuner to **ANT-3**. The antenna switching works well for simple setups like mine. When the amplifier is turned off, the transceiver is connected to **ANT-1**.

Quiet Fans

I've used quite a few different solid-state amplifiers over the years and have been using one regularly in my station for about 10 years. My biggest complaint is loud fan noise, especially as the amplifier heats up with extended use and fan speed increases. Sometimes the pitch of the fan noise is annoying as well, and I almost always end up wearing headphones. When I first turned on the Mercury LUX, the fan was so quiet that I wondered if it was working. It was!



Figure 5 — The companion Windows PC software replicates most of the indicators and control buttons on the front panel.

The Mercury LUX has two fan settings. Speed is controlled automatically, switching into maximum speed if the temperature reaches 45°C (113°F). The **FAN MAX** button on the display overrides the automatic operation and keeps the fan running at top speed. The manual recommends keeping the fan at maximum speed during prolonged operation or digital mode operation.

At maximum speed, the Mercury LUX fan is audible, but I didn't find it objectionable or feel the need to don headphones during casual operation. Subjectively, with the fan running at maximum speed, the Mercury LUX is quieter than my regular station amplifier with the fans running slowly during receive. The LUX fan at high speed sounds about the same as the fan in my transceiver, which runs continuously at a higher speed during transmit.

For most casual SSB, CW, and digital mode operation, I found that the Mercury LUX temperature indicator stayed around 90 to 100°F with ambient room temperature at 70°F. During full-power CW contest operation with a lot of CQing, the temperature tended to rise to 115 to 125°F with the fan set to maximum speed from the front panel. During the ARRL June VHF Contest, I used the amplifier on 6 meters at 800 W output. The temperature stayed around 100°F, even during heavy FT8 operation.

Software

Windows PC software available for download from the KM3KM website allows monitoring and control of the amplifier remotely. After downloading and installing the software on your PC, connect a USB cable from the PC to the USB port on the back of the amplifier. Turn on the amplifier and a new virtual COM port appears on the PC. Find the COM port number in the **PORTS** section of the Windows Device Manager. Start the KM3KM software and enter the COM port number using the **COM** button on the KM3KM software screen. No other configuration is required.

Figure 5 shows the software window. It resembles the amplifier's front panel with bar graphs for forward power, reflected power, and drain current. SWR, temperature, and band are shown numerically. The clickable buttons along the bottom of the screen perform the same functions as on the amplifier display. Repeatedly clicking on the **ANT 1** button scrolls through the antenna choices. Note that you can't turn amplifier power on and off using the PC control software.

The KM3KM software window can't be resized, which may be an issue depending on how crowded your screen is with other software. You can configure the KM3KM software so that the window is always on top of other software or in the background until you click on it.

Protection Features

The Mercury LUX incorporates several features to protect the amplifier. The protection circuitry acti-

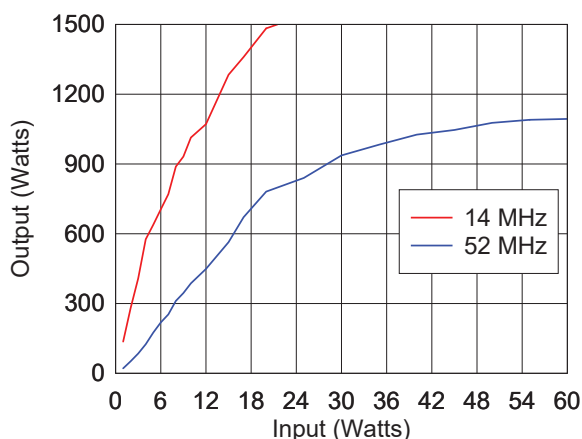


Figure A — KM3KM Mercury LUX RF power input versus RF output.

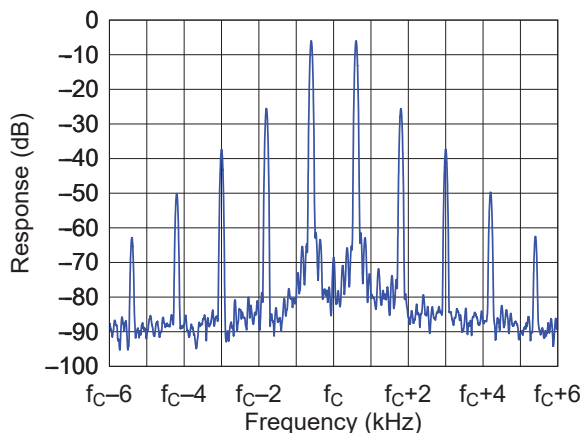


Figure B — KM3KM Mercury LUX 20-meter band third-order IMD performance at 1.5 kW.

vates for excessive drain voltage, drain current, or drive power. Protection also activates if you transmit continuously with more than 800 W for more than a few seconds, if the reflected power exceeds 125 W, or if the temperature exceeds 65°C (149°F). The bar graphs on the front-panel display have labels that show the safe operating limits (for example, the red **45** below the **D.CURRENT** bar). The amplifier switches to standby, a red warning message appears on the display, and an audible alarm sounds (if enabled in the **DISPLAY SETTINGS** menu). Touching the red **RESET** button on the display restores operation once the fault is corrected.

I tripped the continuous carrier warning while transmitting steadily at 1500 W for more than 8 seconds while shooting photos for this review. The red warning message and alarm sound got my immediate attention. I also tripped the reflected power protection when a coaxial feed line in my station failed unexpectedly. In that case, the amplifier reacted instantly and took itself offline as soon as I sent one dit on CW.

The instructions don't offer a maximum SWR limit for antenna systems used with the Mercury LUX, but the 125 W reflected power limit equates to an SWR around 1.8:1 at 1500 W output. On 17 meters, my multi-band beam presents an SWR of 2:1, and I was able to transmit at reduced power by keeping the indicated reflected power below 125 W. If you are using

a multi-band antenna that requires a tuner on some bands, such as the popular end-fed half-wave (EFHW), consider the KM3KM Mercury ATS or another automatic high-power antenna tuner.

Wrapping Up

The amplifier easily met its power output specifications and showed no signs of stress or overheating even during some long operating periods on CW and digital modes. TR switching is relay-based, and there is a noticeable click each time the relay closes. Although the Mercury LUX doesn't support QSK operation, I found the TR turnaround time quick enough for fast CW contacts. Listening on another radio, I didn't hear any shortening of the first transmitted character.

I found the KM3KM Mercury LUX to be very easy to set up and enjoyable to use. The front-panel display is attractive and easy to understand. On-screen controls and indicators are clearly labeled and work as expected. Its light weight and small footprint make it easy to handle and fit into a station layout. If you use the PC remote-control software, you can place the amplifier off to the side somewhere, but you do need to be able to reach the power switch.

Manufacturer: KM3KM Electronics, LLC, Miami, FL, www.km3km.com. Price: \$4,300.