

HF E-Mail with the KAM Series Radio Modems

Ships and yachts at sea may use Kantronics KAM series of HF modem to send and receive radio telex messages (INTERNET text messages, text FAX, and other e-mail formats) inexpensively via most HF marine radio service networks. Five pieces of radio station equipment are required, a portion of which most vessels already have: an antenna, an antenna tuner, an SSB marine radio, a radio telex modem (KAM XL), and a personal computer (PC) with communications software.

MARINE RADIO NETWORKS

Sending E-mail messages to/from ships at sea is highly popular and inexpensive, but there are some complexities to be aware of. Since communication by HF uses sky waves via the ionosphere, the speed that messages may be sent at is limited. The physical phenomenon limiting speed regardless of station transmit power is "multi-path" propagation of your signal. Daily, monthly, and yearly cycles affect communication, with higher HF frequencies most useful during the day and with lower HF frequencies most useful at night. Hence, most radio network service providers maintain a range of HF frequencies at each shore site for use by customers (e.g. The table below displays a partial list of the shore stations of the Globe Wireless marine radio system). Due to this data rate restriction, SITOR messages are limited to text messaging only without file attachments. Costs to use the systems are based on the size of the message, not the time it takes to send the message.

Partial list of Globe Wireless's marine radio network of shore stations:

Shore Station	Station Call Sign	ITU Chan. # (1)	Shore Frequency (kHz)	Vessel Transmit Frequency (kHz)
San Francisco	KFS	8003	8417.50	8377.50
San Francisco	KFS	12003	12580.50	12478.00
East Coast	WCC	8016	8424.00	8384.00
East Coast	WCC	12021	12589.50	12487.00
New Orleans	WNU	8019	8425.50	8385.50
New Orleans	WNU	12057	12607.50	12505.00

SSB RADIO REQUIREMENTS

Commercial coastal stations use radio channels spaced just 500 Hertz apart, so you may hear 4 or 5 stations when dialing just one. Less than optimum performance will be experienced due to interference from signals in these adjacent channels unless you utilize a 500 Hertz IF filter. The filter significantly improves the radio's selectivity and ability to reject adjacent channel interference. Service providers state that the 500 Hertz filter is mandatory.

Commercial stations operate with very tight frequency tolerance so your SSB radio must match that frequency accuracy. Ideally, your radio should have a digital readout which displays Kilohertz to two digits, 12527.00 kHz, not 12527.0 kHz. Most modern maritime and amateur SSB radios have these features, however there are some which do not. If you have an older SSB radio that does not have a digital dial display or has low dial resolution, then it will be difficult to accurately tune shore stations. If your transmitter cannot be set on frequency accurately, exhibits drift characteristics, or is slow when changing between transmit and receive, you'll have difficulty connecting to and maintaining contact with the shore stations.

A couple of other SSB parameters are important: transmit turn on delay and oscillator stability. Your radio should have a transmitter turn on delay of no more than 20 milliseconds and your oscillator stability should be 10 Hz or better. Review your SSB radio specifications carefully to determine if your radio will meet the operational requirements of a marine radio network.

LICENSING REQUIREMENTS

A yacht or ships maritime license is issued by the FCC in the U.S.A. and is required to operate a radio telex station to send/receive HF e-mail. You may apply for a license by visiting the FCC INTERNET web site and filling out FCC Form 506. A fee is charged. A MSSSI (Marine Selective Station Identifier) (9 digit) number is issued with your license when you specifically request the MSSSI number from your regulatory licensing agency. The MSSSI number, in conjunction with your maritime call sign is used as the answerback on radio telex systems (more on this below). The FCC discontinued SELCAL numbers (5 digit); however, if you have a five digit SELCAL number you may continue to use that identifier number. If you do not have either the MSSSI or SELCAL number, then you must apply for just the MSSSI. New SELCAL numbers are no longer being issued in the U.S.A. or internationally.

SENDING MESSAGES, BILLING

Service providers require that a billing code be included when messages are sent from shore to ship, so you'll have to provide that code to friends or business associates sending a message to your vessel. In effect, you pay for incoming messages as well as those you send just like you would with a cellular service. Alternatively, shore side senders can secure their own account number, simply by contacting your service provider. For example, to send a message to a ship using the Global Radio Network, simply type the callsign@globeemail.com and include your billing code which must appear on the first line of text. The form of the billing code must be typed as "BILLING:XYZ123;" but do not include the quote marks.

VESSEL RADIO STATION INSTALLATION

Installing a text messaging system on board requires a bit of knowledge and experience. We highly recommend that you have your marine dealer or someone else who is experienced install your first system. On a yacht for example, a whip antenna can be installed (a 35 foot whip is recommended) or the backstay with insulators can be operated as a long-wire antenna (a backstay antenna of 50 feet is recommended). To cover the range of frequencies provided for by shore stations, an antenna tuner must be installed between the antenna and radio. The tuner allows your SSB radio to maintain full power on all of the frequencies; and is, generally, controlled automatically by the SSB radio. Installation of the modem between the SSB radio and your PC is straightforward; one cable runs between an accessory jack on the radio and the radio jack on the modem, and a standard RS-232 serial cable interconnects the modem and your PC. To optimize your system, you need to look at your vessel grounding system too. Tying the vessel

ground to the engine block or a couple of dynaplates will result in very poor performance at HF frequencies. Care must be exercised to install a quality vessel ground system. Installing 100 square feet of 3" copper strapping throughout the hull is recommended.

HF E-MAIL PROCEDURES

Learning to send/receive messages and operate the station is similar to learning to send/receive INTERNET e-mail with WindowsXP. To send or receive mail, you'll have to connect (link) to one of your service provider's shore stations. Once connected, the shore station will indicate if it has messages for you or sends the message "NO TRAFFIC."

The following example outlines how I sent a test message from my "yacht" to my office e-mail address using the Globe Wireless marine radio network. My yacht station consists of a 16 foot vertical antenna, an ICOM AT-130 antenna tuner, an ICOM M710-05G HF SSB Marine radio (with 500 Hertz filter installed), a Kantronics KAM XL modem, a Gateway PC running Windows XL, and Creative Service Software, Pacterm for Windows.

To send a text-only e-mail message from a vessel, complete the following steps:

1. Tune the SSB radio to find a strong signal from one of your service provider's shore stations, and set the KAM XL in AMTOR (SITOR) standby mode.
2. Wait until the provider's station is not busy, as indicated by a "free signal" transmission.

You must not initiate a call to the station until you hear the free signal; otherwise, you may interfere with an ongoing session. The KAM XL provides visual confirmation of the free signal sent by service providers, including the unique Globe Wireless signal which consists of eight data bursts followed by a Morse code station ID.

3. Then initiate a connection (link) request from your PC keyboard by entering the shore station's ID. For example, to link to any Globe station use (selcal) 1094 as the ID
4. When linked, the station you are calling will automatically gather your MSSSI number.

The shore station issues a \$ sign; this will start the answerback procedure. Your vessel's MSSSI number (or SELCAL if appropriate) and call sign will automatically be sent. Note, your answerback must be in the form of MSSSI CALL SIGN X. For example, if your MSSSI is 987123456 and your call sign is KQ2XVKF, then you set your answerback in the KAM XL as: 987123456 KQ2XVKF X (using the WTEXT command).

5. The shore station will then prompt you for a message address.

The coast station will check your answerback to see that you are a valid customer. If you are registered, the station will issue a go-ahead command "GA+?" Whenever you see "GA+?", it is your invitation to transmit. If you have messages waiting you will be instructed to type "MSG+". If you wish to send a message to an Internet address, you would type the command INT followed by the email address and then a plus sign. All commands end with a + sign. Since SITOR does not allow for full ASCII character sets, you must substitute (AT) for the usual @ used in e-mail addresses.

Example: Using standard Internet to send a message to Kantronics, you would type sales@kantronics.com, HOWEVER to send the message via SITOR, the command looks like: INT SALES(AT)KANTRONICS.COM+.

6. The shore station will echo back the address if it was sent in the proper format.

Next, you will receive a "GA+?", which is your invitation to send your message. Your actual text message may be composed "live" on the air, or prepared ahead of time and sent after the coast station has indicated it is ready to receive your message.

7. To end your message, type KKKK. This initiates a confirmation.

Messages received without KKKK are not processed, so you should wait for the confirmation before entering BRK+, or the message will not be sent.

8. After you receive confirmation that your message has been sent, wait for the Go-Ahead (GA+?) and then send another message or enter a BRK+ to initiate breaking the link.

If you want to send the next message as a text fax, enter the command FAX, followed by the fax number and then a + sign: Example: FAX16507268604+ to send a fax to phone number indicated. Repeat the procedure outlined above.

If you have no further traffic, break the link by typing BRK+ after you receive the go-ahead "GA+?. The link will then drop after Globe Wireless sends "end of work" (SK).

AN E-MAIL EXAMPLE: SENT AND RECEIVED.

I selected ITU channel # 12003 on my M710 radio (from the partial list shown above) since it was the loudest. I then waited until the Pacterm for Windows "HF window" on my PC screen displayed.

"FREE SIGNAL....GW...KFS.....,"

indicating that the shore station was free for another connect. The KAM XL's firmware decodes the "free signal" and sends that message to the PC screen. I then initiated a connect by clicking on "L" for link and entered the shore station's SELCAL, 1094, followed by the enter key. The shore station responded with

**GLOBE WIRELESS
NO TRAFFIC
GA+?**

I then entered my office INTERNET e-mail address, as indicated below in lower case, and waited until the shore station confirmed my "to" address in capitol letters. I then entering my message and completed it by entering KKKK on the last line of the message - required by Globe

to indicate the message is complete. The shore station then confirmed that the message had been sent and sent another GA+?

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GA+?int pandersn (at) kantronics.com+
INTPANDERSN (AT) KANTRONICS.COM
MSG+?
This is a test message from ship to shore.
KKKK
122049 MESSAGE ACCEPTED 1435 01/24/98
GA+?
BRK+
GLOBEWIRELESS SK
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Here's how the message was received at my office e-mail address.

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From: KANTRONICS <KQ2XVJY@globeemail.com>
To: PANDERSN@KANTRONICS.COM
Subject: Test of KAM XL Modem.
Date: Saturday, January 24, 2002 12:29 PM
This is a test e-mail from ship to shore.
KKKK
Received: from KQ2XVJY at Globe Wireless; Sat, 24 Jan 2002
14:35 UTC
Message-id: 445405S62
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Note that the message came from KQ2XVJY, my marine radio station call sign stored in my modem. The SELCAL number mentioned earlier does not appear in the message but was used to enable the connection, when I made that request to the shore station. The shore computer then queried my KAM 98 modem to obtain its (my) SELCAL number and marine call sign and then prompted me to enter a command to send a telex, fax, or text-only e-mail INTERNET message.

In summary, sending and receiving radio telex messages, or short text-only e-mail, is inexpensive and straightforward to set up. At present, traffic on the HF bands doesn't seem crowded and service is generally prompt. As is expected, access does vary as a function of constantly changing ionospheric conditions. Selecting an HF SSB marine radio with built in ITU channel selection is ideal and makes it easy to locate your service provider's shore stations quickly. If you have a SSB marine radio that does not feature dial selection of the ITU channels, you're still in luck. You'll simply have to enter the receive and transmit frequencies required from a chart such as that listed above. In some cases it will be necessary to offset the ITU channels by either -1.7 or -2.2 kHz based upon the radio's readout display; but, in either case, use of a modern SSB radio will allow access to radio telex channels. Most radios provide for a number of user-programmable memory channels so you can store these ITU channels for rapid channel selection later.