

# FAX-4100

## HF FAX Over Radio System



Send FAX images without phone lines or satellite communications! The HAL Communications FAX-OVER-RADIO product line integrates a standard facsimile (FAX) machine into your high frequency radio system. The **FAX-4100** connects between your FAX machine and our DSP-4100/2K radio data modem. The only connection required to the FAX machine is the standard "RJ-11" phone connection. Installation is very simple!

### Sending FAX over radio made easy!

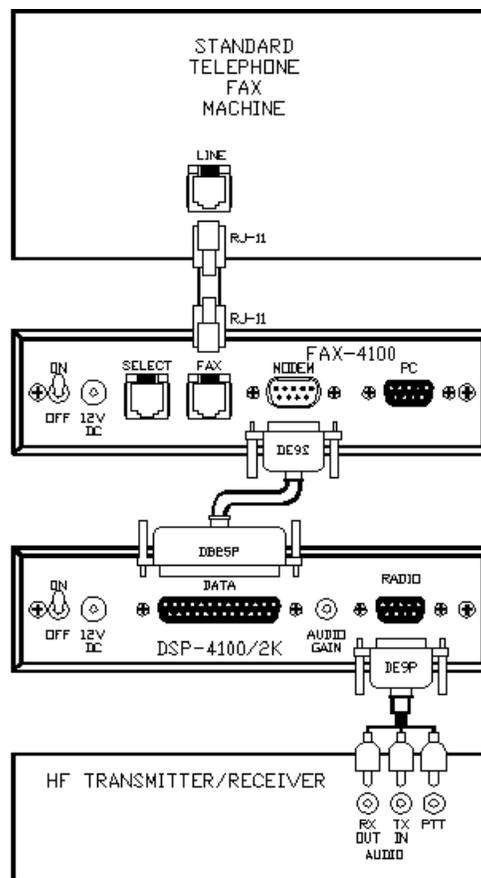
1. Lay your page(s) on the FAX machine.
2. Enter ID of distant station and "#" key.
3. Push "start" on FAX machine.

Radio equipment is transparent to the user. The operator need not know an HF radio system is being used! The **HAL FAX-4100** accepts your "call", decodes the dialed station number, passes this number to the DSP4100/2K, and receives and stores the FAX data in its on-board memory. The FAX-4100 then instructs the DSP4100/2K to "link" with the distant station. Once the link is established the distant FAX machine is polled to be sure it is available to accept an incoming FAX. If the distant FAX machine is available, the data is sent by the DSP4100/2K and is stored in the distant FAX-4100's on-board memory. After it is determined that the FAX is complete a delivery conformation is returned to originating station, the "link" is disconnected, and the delivery confirmation is printed.

A page of business correspondence can be sent in 2 to 10 minutes, depending upon ionosphere conditions and density of the page to be transmitted. Best of all, the FAX operator need not know nor care that an HF radio system is part of the FAX link. It all works - just like a standard FAX telephone transmission! Put the radio stuff in a closet - and don't worry about it!

The FAX-4100 directly interfaces to any standard "Group-III" (G3) telephone FAX machine. We provide ring signal, off-hook loop current, dial tone,

and DTMF tone decoding. At the start of each FAX connection, the FAX-4100's internal FAX modem negotiates data rate and other communications parameters with your FAX machine. On the radio modem side, the FAX-4100 includes the normal link and control commands used by the HAL DSP-4100/2K modem.



Basic FAX-OVER-RADIO System

## SYSTEM COMPONENTS:

The HAL FAX-OVER-RADIO System is simple and makes maximum use of your G3 FAX machine and SSB HF station. Add the DSP-4100 and FAX-4100 and you're on-the-air with FAX.

Virtually all modern SSB HF transceivers may be used for FAX. The 500 to 2500 Hz spectra of CLOVER-2000 is directly compatible with SSB radio passbands. Special bandwidth filters or super phase-linear filters are *not* required. The  $\pm 50$  Hz frequency tolerance is compatible with virtually all modern synthesized SSB equipment. Standard 100 Watt transmitters and simple antennas (1/2 wave dipoles or 1/4 wave verticals) are all that is needed for most FAX-OVER-RADIO links.

Note that all HAL units operate from "nominal" 12VDC (10 to 18 VDC, in fact). The HAL FAX-OVER-RADIO system is a very good choice for either fixed or portable/field installations.

## COMPUTERS & OTHER EXPANSION:

The basic FAX-OVER-RADIO system does not *require* a computer at either end. All control functions and data communications are handled within the HAL FAX-4100 and DSP-4100/2K. This makes for a very low-cost and simple system for remote areas where a computer is not required nor desired.

However, a computer can easily be added to the communications link. This allows use of CLOVER-2000 for all forms of data. If you wish to design custom software, the computer may also be used for further data compression, communication with the radio control port, or other control functions. The DSP-4100/2K includes a second serial I/O port which may be used to connect to the control port of the HF radio, eliminating the need for a second serial port from the computer - a serious problem for lap-top PC's. Standard phone line and data circuit connectors are used to keep installation simple.

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## Specifications

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### FAX-4100:

Connection	2 wire, RJ-11
Form	Isolated & balanced
Loop	24 VDC, 20 ma off-hook
Ring Output	100v p-p, 20 Hz
DTMF	16 tones, TX & RX
Dial Tone	400 Hz
FAX	Group III (T.30)
FAX Data Storage	1 Meg std; 4 Meg optional

### MODEM Port:

Connection	RS-232, DE9P
Format	Serial, asynchronous, 8 bits
Data Rate	9,600 - 57,600 bps
Protocol	To match DSP-4100
Flow Control	Hardware (CTS/RTS)

### PC Port:

Connection	RS232; DE9S
Format	Serial, asynchronous
Data Rate	9,600 - 57,600 bps

**Power:** 10 to 18 VDC

**Mechanical:** 5.75 x 9.6 x 1.7"  
2.75 lbs

### FAX-4100 Interface:

Connects between a standard G3 Facsimile (FAX) machine and the HAL DSP-4100/2K modem. It includes simulation of all phone line signals required for proper operation of the FAX machine. In transmit mode, the FAX-4100 intercepts DTMF number from the FAX dial pad, initiates the ARQ link via DSP-4100/2K, handshakes and stores data from the FAX machine, passes data to DSP-4100/2K, ends the radio link, and disconnects the FAX machine when the FAX has been delivered. In receive mode, the FAX-4100 accepts the call from a DSP-4100/2K and radio link, rings the FAX machine, senses off-hook, handshakes with the machine, and passes data from the DSP-4100 to the FAX machine.

### DSP-4100/2K:

Digital Signal Processor (DSP) modem for use with high frequency (HF) radio equipment. The CLOVER-2000 waveform and protocol is used for data communications between two locations. The modem interfaces between a SSB HF transceiver and the FAX-4100 FAX-OVER-RADIO interface.

### CLOVER-2000:

Voice bandwidth digital communications waveform and protocol for use with HF SSB equipment. CLOVER-2000 uses an Auto-adaptive ARQ mode that continuously corrects for measured changes in the ionosphere-conducted radio signal. The transmit modulation is dynamically adjusted to maximize error-corrected data throughput from 200 to 2000 bits/sec. FAX data can be sent at the rate of 1 page in 2 to 10 minutes, depending upon the page density and the ionosphere conditions.



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