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HFCS-1000

ENVIRONMENTAL COMMUNICATIONS SIMULATOR (ECS)

The HAL HFCS-1000 Environmental Communications Simulator (ECS) is a microprocessor-driven training aid that simulates operation of the RACAL R-2174 (P) URR Radio Receiver used by U.S. Government agencies. The HFCS-1000 internally generates Morse code (CW) and Teleprinter (FSK and DFSK RTTY) signals over a simulated spectrum of 0.5 to 30.0 MHz (full tuning range of the R-2174). More than 1,000,000 background signals from ten geographical regions of the world are generated (more than 100,000 per region). In addition, "target" signals and text may be injected via a serial I/O computer connection. Ionospheric propagation effects, noise sources, and various interference effects may also be selected via the serial I/O port.

The HFCS-1000 is designed to be used in a multi-station training situation wherein many receiver simulators are driven by an instructor's computer via a Local Area Network (LAN). When time-coordinated through the computer network, each HFCS-1000 in the classroom is time synchronized so that each student receives the target text at the same time and frequency. This assures an accurate and fair assessment of each student's performance. All adjustable panel control positions are monitored and may be read by the instructor's computer via the serial I/O port to provide information about student operational errors during the training session. The HFCS-1000 may also be used to send instructor-driven Morse code drills to students.

The HFCS-1000 is the same mechanical size as the R-2174 receiver and the front panel duplicates the appearance, controls, and displays of the receiver. External connections include AC power, RS232C serial I/O port, and three audio outputs (headphone, speaker, and constant level line). The HFCS-1000 is con-structed in modular form to assure rapid and simple repairs. The HFCS-1000 may be manufactured in either commercial or TEMPEST (NACSIM 5100A) versions.

HFCS-1000

SPECIFICATIONS

Frequency range:	0.5 to 30.0 MHz
Bandwidths:	400 Hz, 1.5, 3.4, 8.8, 12.0 kHz
Bandpass Selectivity:	Up to 6 CW or 4 CW and 2 FSK signals in the passband at a given time.
Tuning Rates:	Fast (1 kHz), Slow (30 Hz), Very Slow (1 Hz) increments
BFO Offset:	+/-3000 Hz
AGC Response:	Short (30ms), Medium (200ms), Long (3.75 sec)

DISPLAYS:

Frequency:	8 digit red seven segment display
BFO:	3 digit red seven segment display
Bandwidth:	2 digit red seven segment display
Signal Strength:	10 segment red bar graph
MODE:	Red indicator to show CW mode
AGC:	3 red indicators (Short, Medium, Long)
Tuning Rate:	1 red indicator (Fast)

FRONT PANEL CONTROLS:

Power:	AC power ON/OFF switch
AF Gain:	Controls Headphone and Speaker output volume level.
IF Gain:	Simulated, but no effect
LEFT Keypad:	BW1 to BW5 bandwidth selection ACC Time constant selection
Main Tuning:	Sets simulator frequency
RIGHT Keypad:	Tuning Rate (Fast, Slow, Very Slow) Lock (locks main tuning control) BFO (selects offset) 0 - 9 Digits - select frequency ENTER - enter selected frequency
Other Controls:	Simulated, but not operational.

I/O CONNECTIONS:

Headphone:	Front panel 1/4" headphone jack; controlled by Volume control.
Audio:	2 rear panel 1/4" stereo tacks
Speaker:	8 ohm, 2 Watts, controlled by Volume control
Line:	600 ohm balanced, 0 dB m, constant level
Power:	International IEC AC Connector 120 VAC +/- 10%, 60 Hz, 30 Watts.
Serial I/O:	DB25, RS-232C serial I/O connection to training computers; data rate set Internally for 9600 baud, ASCII code. Includes TXD, RXD, CTS, and RTS signals plus signal and chassis ground.

MECHANICAL:

Size:	Front Panel: 5.25" high x 19" wide x 3/16" Rack mounting panel.
Depth:	18.25” behind front panel; Handles extend 1.5” beyond front panel.
Weight:	28.5 Ibs, cg at center of cabinet
Slides:	Optional non-rotating chassis slides for rapid removal from rack cabinet.
Finish:	Front panel: Light gray to match R-2174 Cabinet: Tan irridite to match R-2174

SIMULATION:

Background signals:	Morse (CW) or RTTY (FSK/DFSK) signals in a random frequency and amplitude distribution. Morse = 5-45 CPM; RTTY = 20 to 150 baud, 0 to 9999 Hz shift, Baudot or ASCII. Call signs randomly assigned as appropriate to selected geographical region.
Propagation Effects:	Selected via serial I/O commands from instructor’s computer link. Signal strength and noise appropriate for selected diurnal and sunspot variations in frequency. Call signs and therefore apparent propagation distance from background signals controlled by propagation effects.
Man-made Noise:	QRM: background signal interference, ECM, and Over The Horizon HF Radar interference. Upon command by instructor.
Natural Interference:	Sunspot activity, Aurora Borealis effect, Random noise. Random distribution when enabled by instructor.
Target Signals:	Frequency, mode, text, and call signs as downloaded from Instructor’s computer.
Network Simulation:	Simulates text and mode of operation for complex split frequency master/remote HF communications network. Both master and remote signal parameters are loaded as separate target signals with alternate text transmissions.
Character Drills:	Generates Morse code audio tones from practice text downloaded by instructor.

REMOTE COMMANDS:

Serial I/O:	RS-232C, ASCII data at 300-9600 baud (Selected internally).
Command Format:	<STX> CC [DATA] <ETX> (CHECKSUM) <STX> = ASCII STX character CC = Two letter command [DATA] = Variable length data field <ETX> = ASCII ETX character (CHECKSUM) = Checksum of command.
Commands:	Set Time, Month, Latitude, Longitude, Target Frequency, CW Mode, CW CPM, CW Weight, CW Quality, FSK Code, FSK Data Rate, DFSK Code, DFSK Data Rate, Target Signal Strength, Noise Interference Type and Attenuation, Load Message Buffers, Check HFCS-1000 Status.

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