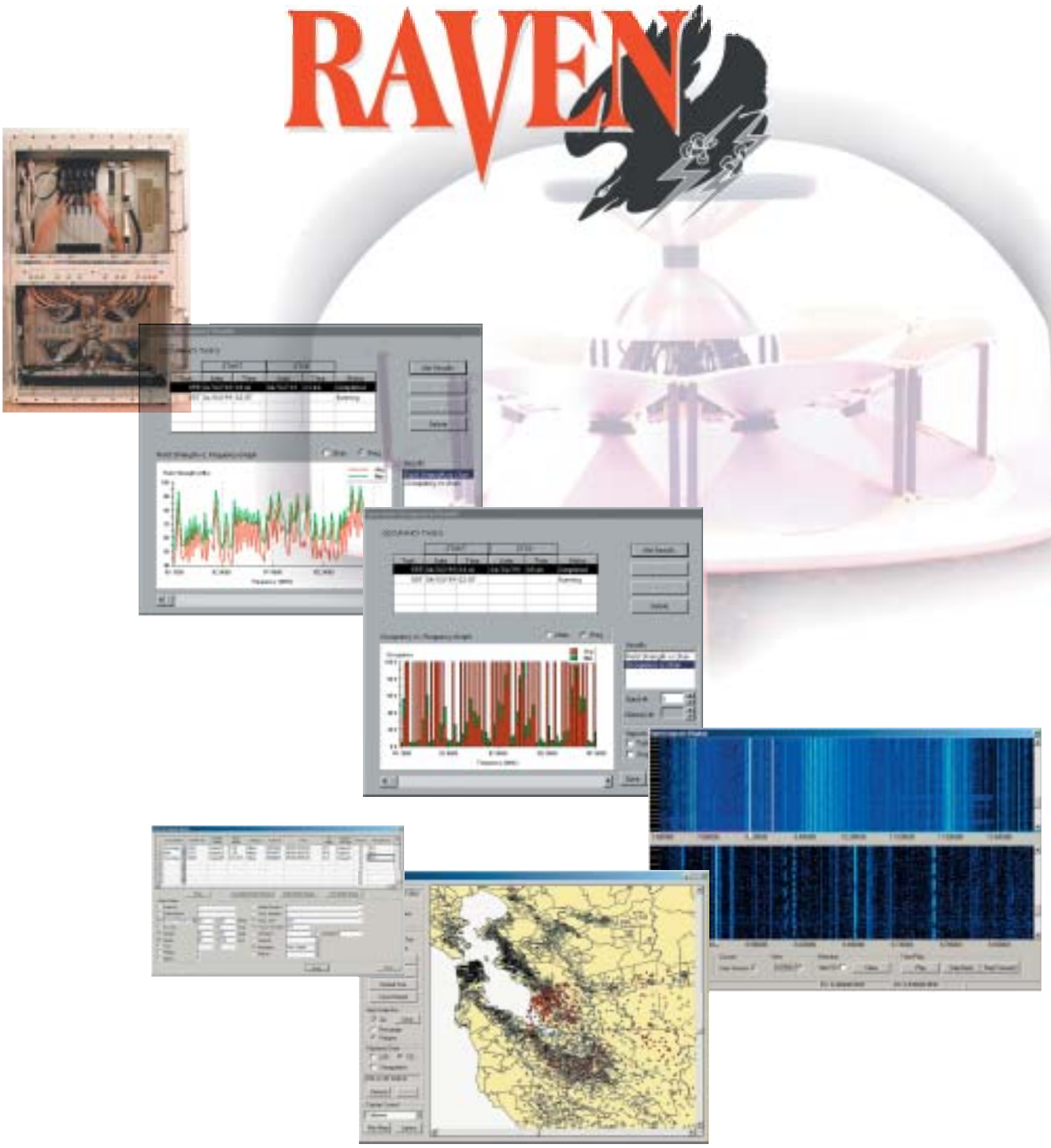
TCI
A Dielectric Company

MODEL

901
RAVEN

Wideband Signal Acquisition, Location and Analysis System



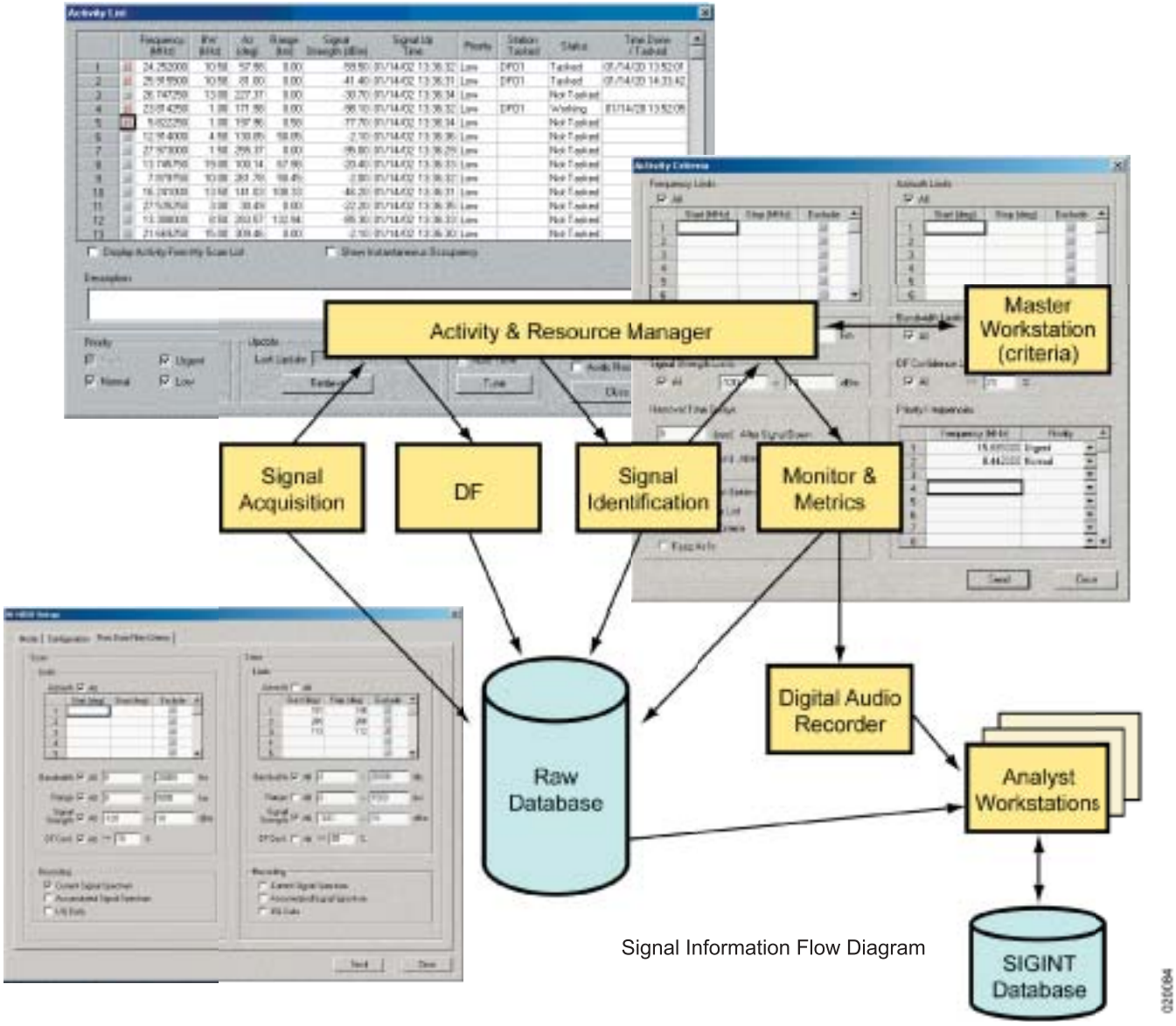
A fully integrated system providing all the measurement and analysis tools needed for signal intelligence of classic narrow-bandwidth and modern wide-bandwidth signals from 1.5 to 3000 MHz.

RAVEN Integrates all functions needed to detect, locate, analyze, and archive narrow and wide bandwidth signals in the HF through UHF bands.

- Complete system from antenna to operator workstations with all components fully integrated providing a seamless and elegant solution for today's modern sigint requirements.
- 1.5 to 3000 MHz input frequency range for complete HF through UHF coverage in a single system.
- Up to 24 MHz instantaneous measurement bandwidth for rapid signal acquisition.
- Up to 192000 channel measurement resolution for accurate frequency discrimination
- Wideband multi-channel digital signal processing with instantaneous analysis bandwidths from 100 Hz to 10 MHz.
- Flexible modular hardware architecture allows systems to be built in a wide variety of configurations matched to the user's specific needs and cost constraints.
- High-speed signal acquisition and analysis combined with automatic activity detection tools provide operators with convenient, informative and powerful means of identifying and locating specific signals of interest in a crowded signal environment.
- Real-time signal displays and analysis tools allow fast and accurate signal identification.
- Integrated Geographical Information System (GIS) provides a clear display of the signal environment.
- Intercept and location of traditional (narrowband) signals, as well as modern wideband signal formats.
- Multi-element antenna feeding multi-channel DF receivers provides fast and accurate direction finding from HF through UHF bands. Optional real-time ionospheric sounder provides Single Site Location capability for HFDF.
- Automatic multi-station networking capability greatly improves location intercept accuracy, speed, and throughput.
- Automatic high-speed database captures all measured signal activity for post-facto analysis.
- Optional narrowband signal classification/identification processors simplify search for specific signals of interest.
- Optional drop receivers for monitoring and recording signals of interest.
- Digital recording and playback allows review and off-line analysis of intercepted signal traffic.
- Flexible Client-Server architecture supports Local, Remote, Automatic, and Multi-user operations among multiple radio sites connected to one or more operator sites.
- Modular hardware front end including radio receivers and DSP-based signal processors and analyzers are combined with a computer-based back end including powerful RAVEN software for the data base server and operator workstations.
- Available in configurations for fixed-station and mobile requirements.

Fixed-Site WBHF Equipment

Mobile Configuration



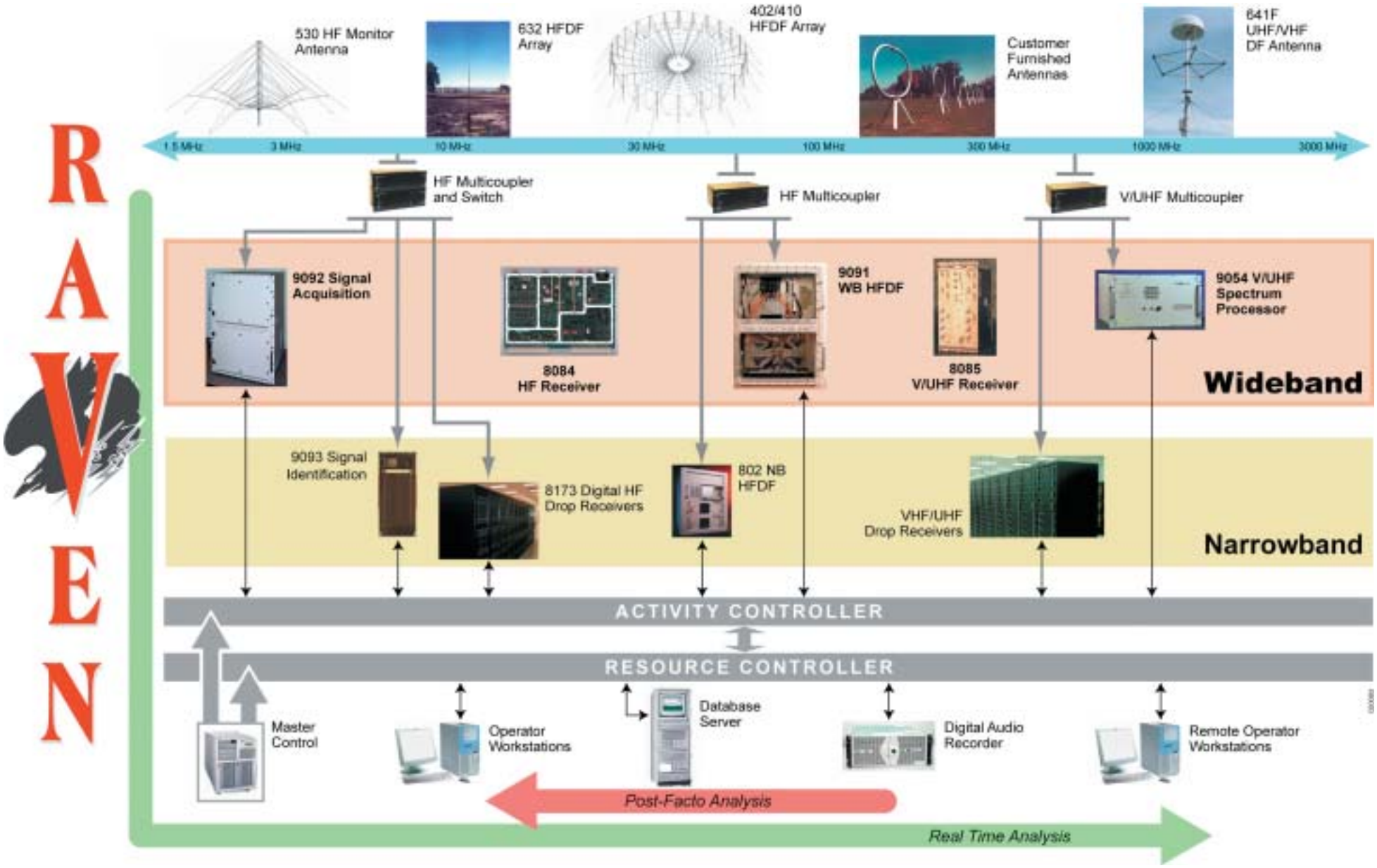
Signal Information Flow Diagram

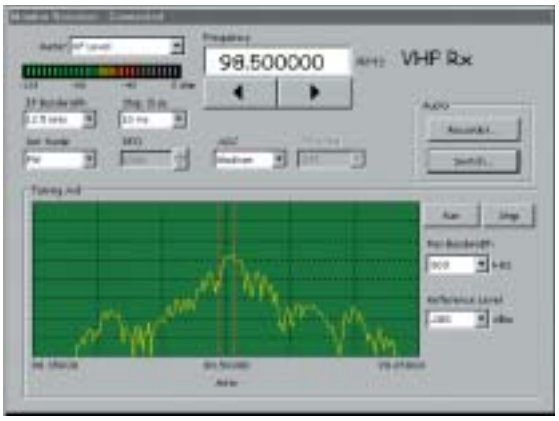
The 901 system accepts signals received from multiple radio receivers and processes the digitized outputs of the receivers to determine signal activity (by new energy detection), location (by radio direction finding), signal identification/classification (by signal feature analysis), and signal statistics/metrics (by spectrum monitoring). Signals identified by the system as Signals Of Interest (SOI) are further analyzed, monitored, and recorded (archived) for intelligence collection purposes.

All of these tasks are managed by the signal activity management and resource management features of the RAVEN software. All data output from the measurement hardware (such as the 9092 Signal Acquisition Processor and 9091 DF Processor, etc.) is stored in the 901 raw database in real time. Up to 3 days of continuous data recording can be stored on the raw database server. This data is then available for real-time (live on-line) or post-facto (delayed playback) signal intelligence analysis by the analyst workstations. The results of the signal intelligence analysis are then stored in the sigint database.

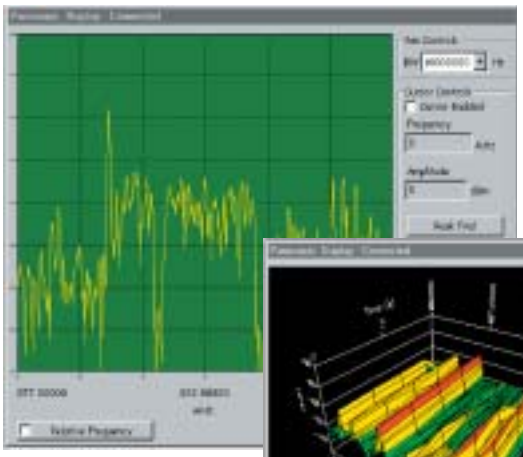
The 901 system is capable of simultaneously running all tasks associated with data collection and analysis for new signal detection, DF, signal identification, signal statistics/metrics, and SOI monitoring and recording. In addition, the 901 can play back the data from the raw database to the analyst workstations for post-facto analysis at the same time that the system is collecting new real-time data.

RAVEN software provides the system operators with comprehensive and easy-to-use tools and GUI displays needed for rapid and accurate signal intelligence collection.

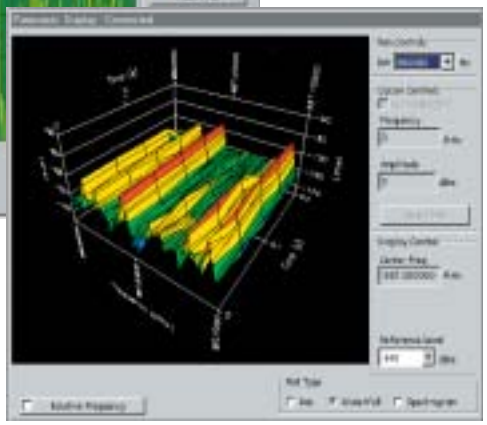

RAVEN
530 HF Monitor Antenna
632 HFDF Array
402/410 HFDF Array
Customer Furnished Antennas
641F UHF/VHF DF Antenna
1.5 MHz
3 MHz
10 MHz
30 MHz
100 MHz
300 MHz
1000 MHz
3000 MHz
HF Multicoupler and Switch
HF Multicoupler
V/UHF Multicoupler
9092 Signal Acquisition
8084 HF Receiver
9091 WB HFDF
8085 V/UHF Receiver
9054 V/UHF Spectrum Processor
Wideband
9093 Signal Identification
8173 Digital HF Drop Receivers
802 NB HFDF
VHF/UHF Drop Receivers
Narrowband
ACTIVITY CONTROLLER
RESOURCE CONTROLLER
Master Control
Operator Workstations
Database Server
Digital Audio Recorder
Remote Operator Workstations
Post-Facto Analysis
Real Time Analysis



Receiver Control Display

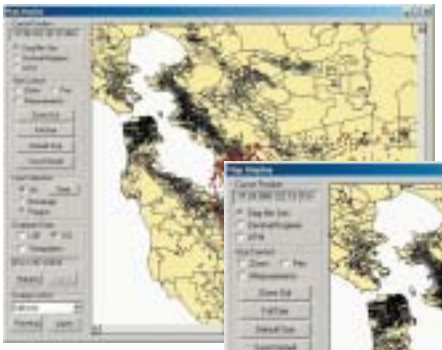


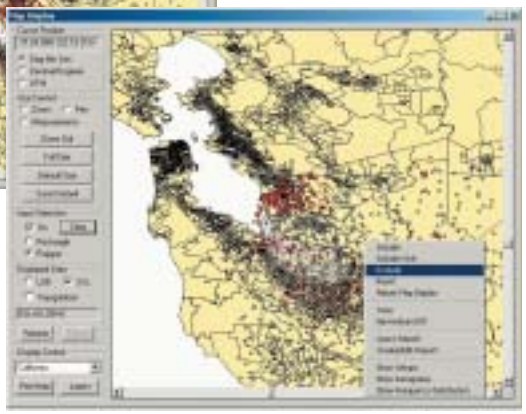
Wideband VHF
Spectrum Display



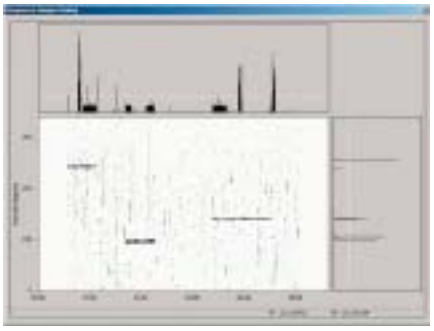
Waterfall Display

System Setup Display

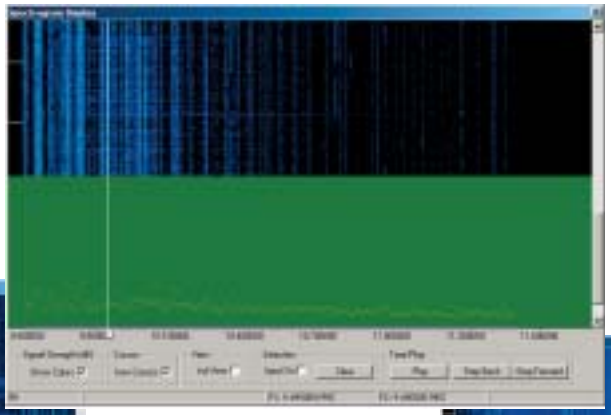


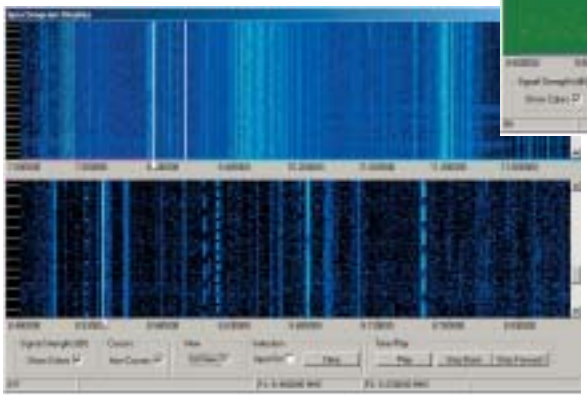


Map and Controls
Display

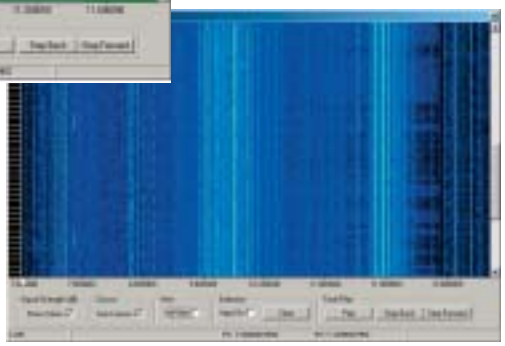


HFDF Results
Azimuth/Frequency Display





Wideband Realtime HF
Monitoring Spectrogram
Displays



Specifications

Antennas & RF Distribution

HF Antennas

632 DF & Monitor Array .... 2 – 30 MHz, vertical polarization

402 DF & Monitor Array .... 2 – 30 MHz, horizontal polarization

410 DF & Monitor Array .... 2 – 30 MHz, dual polarization

530 Monitor ..... 2 – 30 MHz, horizontal omni

Customer-Supplied ..... FRD13 (Pusher), FRD10

V/UHF Antenna

641 DF & Monitor Array .... 20 – 3000 MHz, vertical polarization

HF RF Distribution ..... Wide selection of HF Multicouplers and non-blocking RF Switches distributing antenna RF from 7 – 31 beams to 8 – 280 HF monitor receivers.

8105 HF Multicouplers ..... 0.5 – 30 MHz, 8 outputs per input, 5 dB noise figure, 2 dB gain, +40 dBm IP3

7184 HF Switch ..... Non-blocking, N-input by 4-output, N = 8 to 31, 0.5 – 30 MHz

V/UHF RF Distribution ..... V/UHF Multicouplers and Switches providing outputs for V/UHF monitor, DF, and drop receivers. Configuration matched to receiver requirements.

NB HFDF Subsystem

802 Narrowband HFDF

Frequency Range ..... 1.5 – 30 MHz

Tuning Speed ..... 1 ms for 1 MHz step

Number of channels ..... 7 to 24 (depends on HFDF antenna configuration)

IF Bandwidth ..... 3 kHz (per channel)

Noise Figure ..... 15 dB

IMD Intercept ..... +30 dBm

In-band DynamicRange .... 60 dB

DF Processing Bandwidth ..... 100 Hz to 3000 Hz, programmable in 100Hz steps

DF Processing Speed ..... 100 ms typical

DF Accuracy ..... 2 degrees rms

SSL Range Accuracy ..... 12% rms, 200 – 1000 km range (requires TCI 820A sounder option)

Monitor Receivers

8173 HF Receiver

Frequency Range ..... 1.5 – 30 MHz

Tuning Speed ..... 5 ms typical

IF Bandwidth ..... 6000 Hz

Noise Figure ..... 15 dB

IMD Intercept ..... +30 dBm

In-band Dynamic Range ..... 60 dB

Demodulation Bandwidth ..... 300 Hz to 6000 Hz, programmable

Demodulation Modes ..... AM, CW, LSB, USB

Audio Output ..... 0 dBm (600 ohm balanced or low Z unbalanced)

PAN Output ..... Panoramic display of signal spectrum (amplitude vs frequency) in the receiver IF bandwidth.

8085 VHF/UHF Receiver

Frequency Range ..... 20 – 30000 MHz

Tuning Speed ..... 1 ms for 10 MHz step

IF Bandwidth ..... 10 MHz and 500 kHz (selectable)

Noise Figure ..... 9 dB (preamp on)

IMD Intercept ..... +18 dBm (preamp off)

In-band Dynamic Range ..... 65 dB

Demodulation Bandwidth ..... 1 kHz to 200 kHz, programmable

Demodulation Modes ..... AM, CW, LSB, USB, FM (w/DSP demod)

9054 VHF/UHF Spectrum Processor

Frequency Range ..... 20 – 30000 MHz

Tuning Speed ..... 1 ms for 10 MHz step

Number of Channels ..... 2 x 10 MHz

Total Instantaneous Bandwidth ..... 12 MHz and 250 kHz (selectable)

Noise Figure ..... 9 dB (preamp on)

IMD Intercept ..... +18 dBm (preamp off)

In-band DynamicRange .... 60 dB

Resolution Bandwidth ..... 6.25 kHz to 12 MHz, programmable

Signal Acquisition Speed ..... 1 ms typical

DF Processing Speed ..... 5 ms typical

DF Accuracy ..... 2 degrees rms

Signal Processors

9091 WBHF DF Processor

Frequency Range ..... 2 – 30 MHz

Tuning Speed ..... 1 ms for 2 MHz step

Number of Channels ..... 12 (9 to 24) x 2 MHz

Total Instantaneous Bandwidth ..... 2 MHz or 500 kHz

Noise Figure ..... 16 dB

IMD Intercept ..... +30 dBm

In-band Dynamic Range ... 85 dB

Resolution Bandwidth ..... 125 Hz to 1000 Hz, programmable

Signal Acquisition Speed ..... 2 ms

DF Processing Speed ..... 58 ms

DF Accuracy ..... 2 degrees rms

SSL Range Accuracy ..... 12% rms, 200 – 1000 km range (requires TCI 820A sounder option)

9092 WBHF Signal Acquisition Processor

Frequency Range ..... 2 – 30 MHz

Tuning Speed ..... 1 ms for 2 MHz step

Number of Channels ..... 6 x 2 MHz (12 x 2 MHz optional)

Total Instantaneous Bandwidth ..... 12 MHz (24 MHz optional)

Noise Figure ..... 16 dB

IMD Intercept ..... +30 dBm

In-band Dynamic Range ... 85 dB

Resolution Bandwidth ..... 62.5 Hz to 1000 Hz, programmable

Signal Acquisition Speed ..... 50 ms

New Signal Detection Rate ..... 100 per second

9093 HF Signal Identification Processor

Frequency Range ..... 2 – 30 MHz

Tuning Speed ..... 5 ms typical

Number of Channels 16

Channel Bandwidth ..... 300 to 6000 Hz programmable

Noise Figure ..... 15 dB

IMD Intercept ..... +30 dBm

In-band Dynamic Range ... 60 dB

Resolution Bandwidth ..... 5 Hz to 150 Hz, programmable

Signal Identification Speed ..... 330 ms typical

New Signal Identification Rate ..... 48 (16x3) per second typical

Number of Signal Types ... 2 preprogrammed, plus user-defined types downloadable via remote interface.

Data Analysis

Database Server

Processor ..... Quad Xenon, RAID hard disk

Operating System ..... MS Windows 2000 Server

Data Base ..... MS SQL Server

Storage Capacity ..... up to 10 TB (10,000 GByte)

Report Recording Rate ..... up to 20,000 reports per second

Post-facto Analysis Period ..... up to 3 days

Live Processing Rate ..... 20% of real-time

Network Interface ..... 100Base-T Ethernet (TCP/IP)

Workstations

Processor ..... Dual Pentium 4 or Xenon

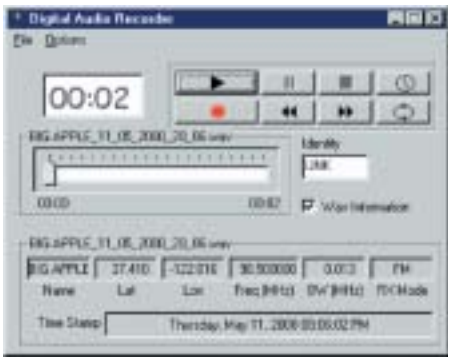
Operating System ..... MS Windows 2000 or XP

Application Software ..... TCI RAVEN

Number of Active Stations ..... up to 100

Digital Audio Recorder ..... 1 or 2 channels per workstation with up to 48 hours stored audio per workstation

Drop Receivers ..... 1 or 2 per workstation



Digital Recorder Screen

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