WJ-36500 **SIRS**

MICROWAVE RECEIVING SYSTEM

System Overview

The WJ-36500 Signals Intelligence Receiving System (SIRS) is a 0.03 to 40.0 GHz ESM/ELINT/COMINT receiver which maximizes current capability and future adaptability. This modularly designed superheterodyne receiver consists of a C-100 control/display unit; an optional C-200 scan display; an EF-100 equipment frame with one or more demodulator plug-ins, depending upon desired IF bandwidth and video performance; and one or more octave or multioctave tuners, or the FXT-1XX millimeter extensions. Future enhancement capability is designed in now.

The C-100 controls SIRS operations; displays operating parameters, status, IF Pan and analysis mode video; and accepts configuration programming. This unit has internal removable mass memory and supports multiple standard interfaces.

The C-100 panel includes 8 "soft keys" for maximum versatility. Controller panels are backlit and may be night-vision-goggle (NVG) compatible. Parameter values are entered via three methods: numeric keypad, cursor increment (arrow keys), and slew knob (shaft encoder). Operation is "user-friendly" with automatic prompting. An optional external keyboard is available for "touch-typist" operators who desire even faster command execution.

The C-100 electroluminescent (EL) display provides operation, configuration, and diagnostic reports; BITE status; flexible RF, IF and time spectrum displays with a selectable refresh/decay rate; as well as an AM/FM display mode for accurate measurement of broadband emitters' frequency excursions. SIRS may also include an audio alarm which alerts the operator to important but infrequent events such as detection of energy above 18 GHz.

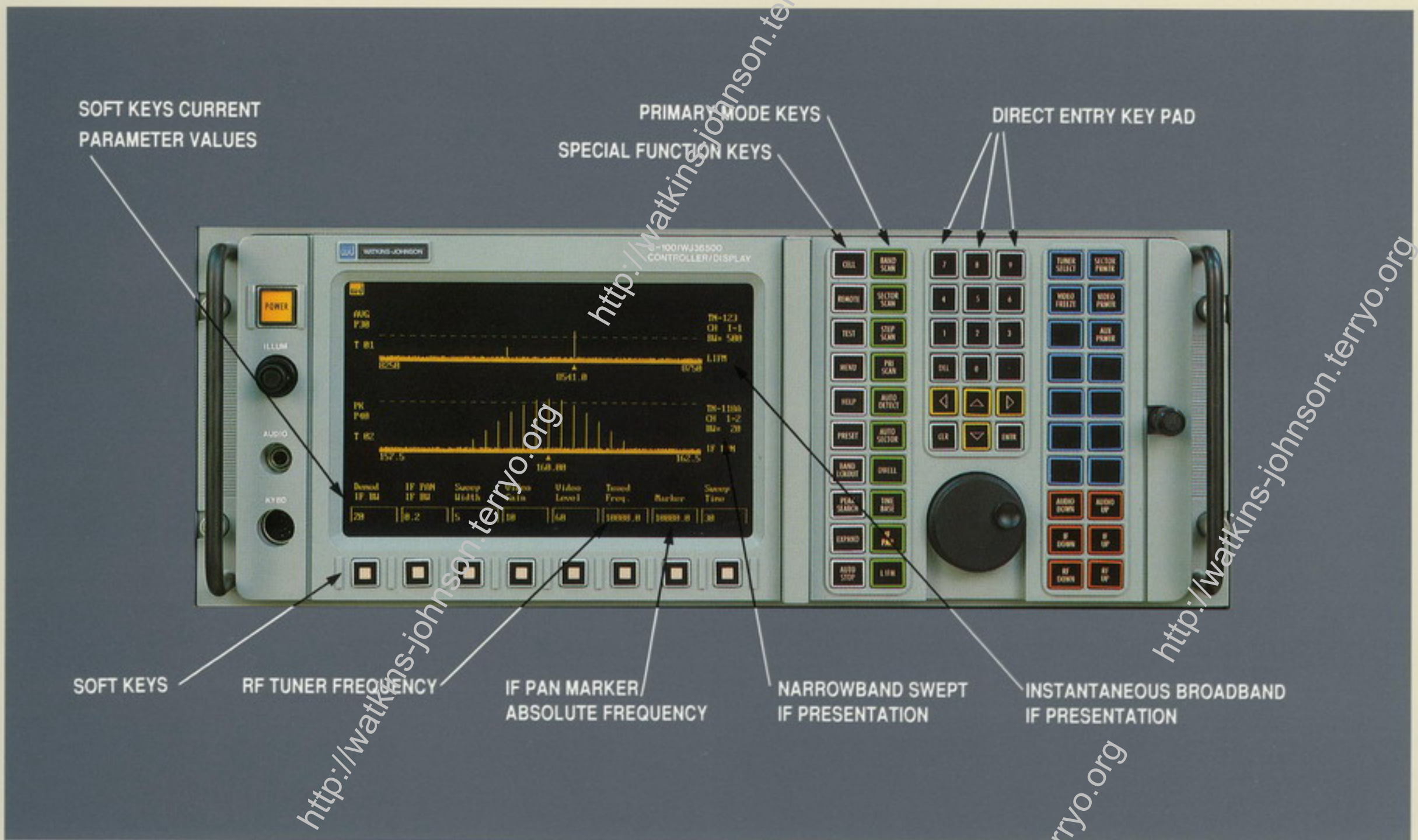The C-200 scan display is capable of RF panoramic display for up to eight additional tuners.

The SIRS controller design incorporates features which facilitate acquisition of difficult-to-detect emitters, such as those with a low duty cycle. For example, scan coverages and sweep rates may be optimized to enhance probability of intercept for specific signals. In addition, a "scan priority" feature allows the operator to choose the number of scan repetitions over each frequency sector relative to the other sectors. Mission profiles, called receiver instruction sets (RISs), can be created on-line (or off-line on a personal computer) and stored in the C-100. They include receiver control parameters such as mode, frequency scan limits, frequency markers, frequency lock-out sectors, priority, dwell times, attenuation, sweep rate, threshold levels, video select, IF pan settings, and IF bandwidths.

The EF-100 equipment frame, containing internal power supplies and video switching, accepts plug-ins including five demodulator families, various switching matrices, and custom units.

Basic Features

- 0.03 to 40 GHz Frequency Reception (with extensions up to 110 GHz)
- Single/Independent or Multi/Interactive Operator Positions
- Basic System Controls 60 Tuners and Demodulators
- Narrowband and Wideband Tuners/Demods for Signal Analysis
- Solid-State, High-Resolution Alphanumeric/Graphic Displays
- Programmable Soft Keys
- On-Line/Off-Line Programmable Mission Scenarios
- Front Panel Configurable Display Presentations
- Digitally Refreshed RF/IF/Time Spectrum Displays
- Multiple External Interfaces
- Powerful Communications of Graphics/Status/Scenarios/Reports to or from External Computers/Printers/Plotters
- Built-In Operational/Diagnostic/Help Menus; Auto Prompting
- Smart System Executive: Asset/Option Polling and Recognition
- Internal Removeable (for Security) Mass Memory
- Modular Open Expandable System Architecture
- Scan, Acquisition, Manual and Analysis Modes
- Plug-In Upgradeable Demodulator/Equipment Frames
- Multiple Sector Scans Per Tuner

SOFT KEYS CURRENT PARAMETER VALUES

PRIMARY MODE KEYS

SPECIAL FUNCTION KEYS

DIRECT ENTRY KEY PAD

SOFT KEYS

RF TUNER FREQUENCY

IF PAN MARKER/ ABSOLUTE FREQUENCY

NARROWBAND SWEPT IF PRESENTATION

INSTANTANEOUS BROADBAND IF PRESENTATION

C-100 Control/Display: Rapid execution of all standard receiver functions is achieved via six primary mode keys. Single keystroke mode selection presents relevant operating parameters adjacent to the soft keys. Any value may be altered quickly. Powerful acquisition and analysis modes are equally simple to implement.

OPERATIONAL FEATURES

Scanning Modes
- Full Band
- Sector
- Priority

Acquisition Modes
- Step/Scan
- Lock-Out
- Auto-Detect
- Auto-Sector
- Signal-Search
- Programmable Thresholds
- Handoff

Manual Modes
- Fixed-Tune
- Dwell
- Hold

Analysis Modes
- IF Pan
- LIFM
- Scan Patterns
- Pulse-Train Display

Operator Interface
- Primary Mode Keys
- Soft Keys
- Automatic Menu Prompts
- Numeric Keypad
- Cursor (Arrow Keys) Control
- Slew Knob (Shaft Encoder)
- Keyboard (optional)

Parameter Control
- RF and Millimeterwave Frequency
- IF Bandwidth (10 kHz to 500MHz)
- RF/IF Attenuation
- RF Distribution Switching
- IF/Video Switching
- AGC, MGC
- Threshold
- Markers
- Scan Rates
- IF Pan Settings
- Detection Modes
- Time-Based Display Settings
- Audio
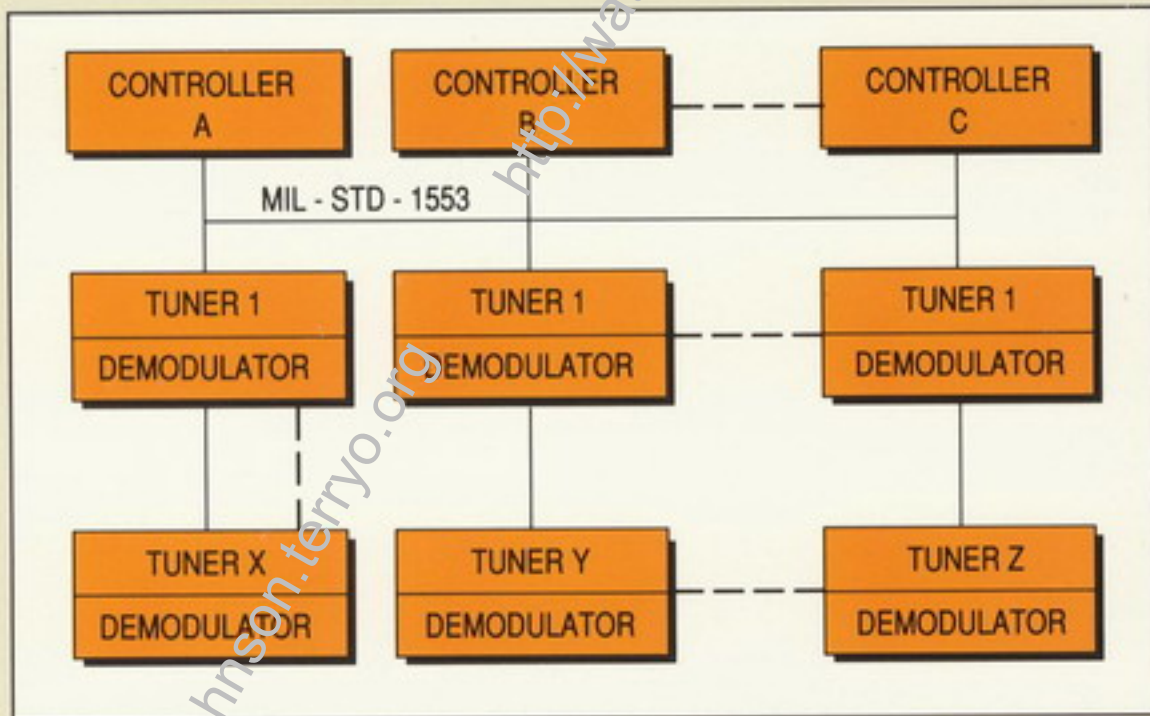- Display Freeze/Decay

System Architecture

The WJ-36500's architecture provides the user with the flexibility necessary to meet varying mission requirements and facilitate future system expansion. Its modular design permits adjustment of the receiver's frequency coverage and configuration. Single-and multiple-operator configurations with narrowband and/or wideband analysis ability are standard. Future expansion is accomplished by connecting additional units. The system executive will automatically recognize the additions. Controllers in multioperator systems are interactive and may "hand-off" tasking to each other, or "borrow" currently unused assets.

The C-100 uses multiple microprocessors and incorporates MIL-STD-1553B digital bus architecture. The system can include any combination of octave- and multioc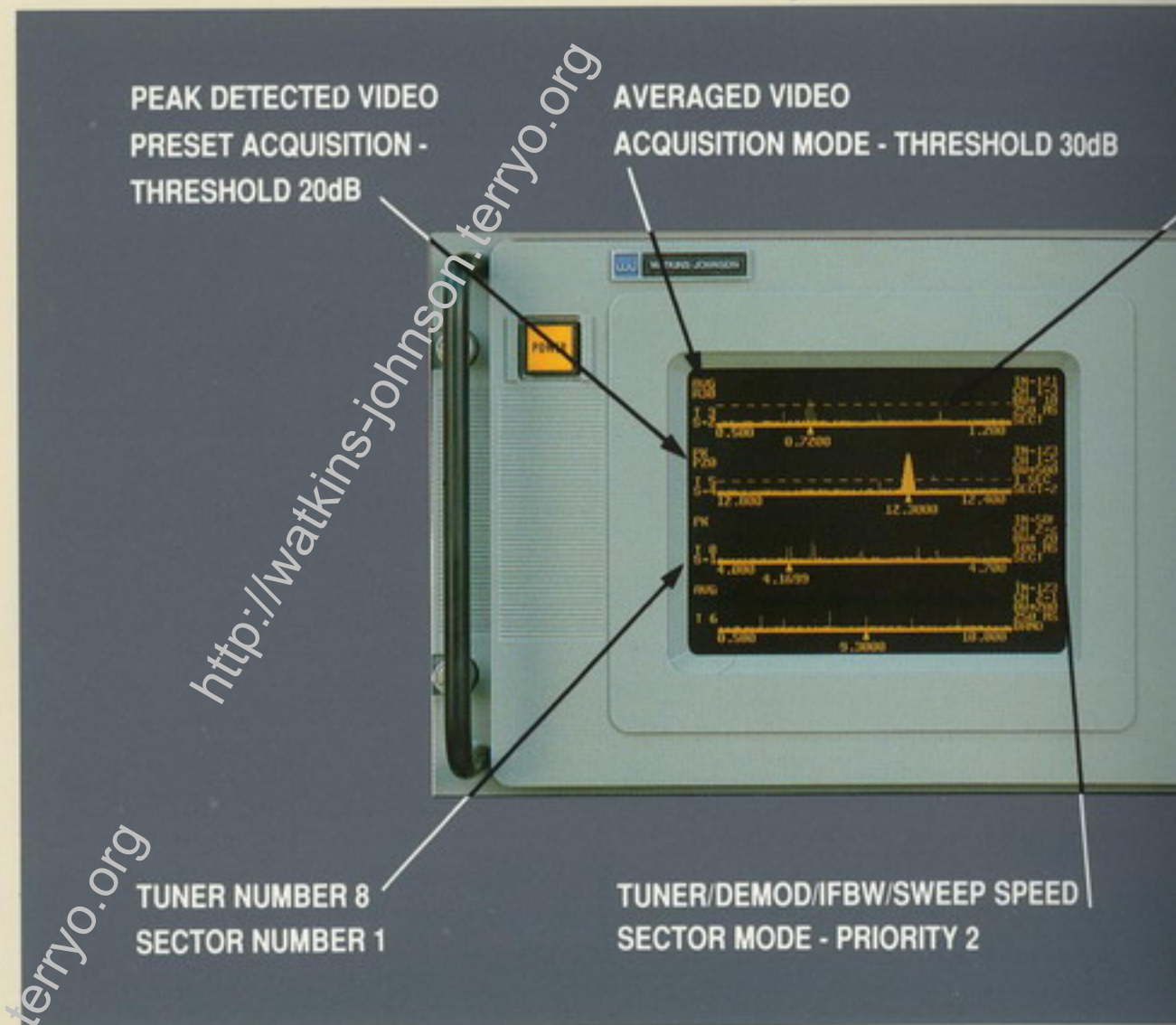tave-band tuners. Retrofits may utilize existing assets, either analog or digitally tuned. The basic system is able to control 60 tuners and demodulators; junction units expand this number to several hundred. Tuners offering special characteristics, such as phase-locked scan, are exploited by the system software.

C-200 Display

The C-200 dual-panel scan display offers both normal and expanded modes. Normal mode presents individual videos from up to 8 selected tuners on separate traces (four per panel). Expanded mode provides increased frequency resolution by distributing a single tuner's video among as many as 4 traces. This feature is especially useful for multioctave tuners and/or multiple sector scans per tuner.

Open system architecture facilitates future expansion/enhancement.

C-100 System Configuration Report

PEAK DETECTED VIDEO
PRESET ACQUISITION -
THRESHOLD 20dB

AVERAGED VIDEO
ACQUISITION MODE - THRESHOLD 30dB

TUNER NUMBER 8
SECTOR NUMBER 1

TUNER/DEMOD/IFBW/SWEEP SPEED
SECTOR MODE - PRIORITY 2

Display Features

- High Resolution
- Solid-State
- Digitally Refreshed
- Alphanumeric Annotation
- User Configurable
- Multiple Adjustable Thresholds
- Freeze and Store
- Built-In Help Menus/Prompts

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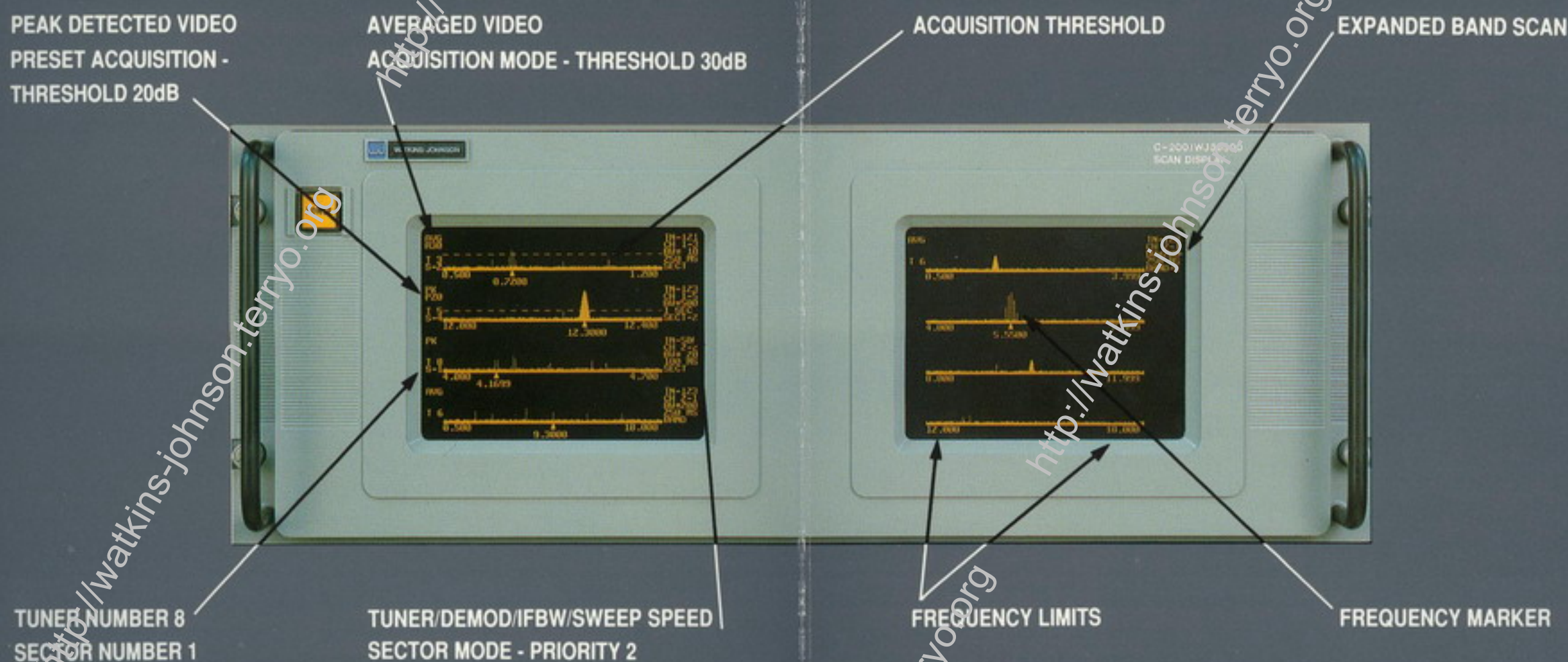
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Maintainability

A receiver's maintainability is greatly enhanced by the quality of built-in test equipment (BITE) provided. In SIRS, the BITE capability is powerful. Each unit has its own BITE circuitry which monitors vital functions for proper values. BITE data are then sent to the C-100 from which a composite report may be generated. If there is a nonconforming value detected, an error message is generated to alert the operator. This is displayed regardless of the current operating mode of the system. In this manner, the operator can assess the merit of continuing operation versus immediate maintenance action.

Maintenance personnel can use the system's extensive reporting to assist their troubleshooting efforts. The system can also be programmed to interact with and/or control external test equip-

PEAK DETECTED VIDEO
PRESET ACQUISITION -
THRESHOLD 20dB

AVERAGED VIDEO
ACQUISITION MODE - THRESHOLD 30dB

ACQUISITION THRESHOLD

EXPANDED BAND SCAN

TUNER NUMBER 8
SECTOR NUMBER 1

TUNER/DEMOD/IFBW/SWEEP SPEED
SECTOR MODE - PRIORITY 2

FREQUENCY LIMITS

FREQUENCY MARKER

C-200 Scan Display

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C-100 RIS Parameter Report

ACQUISITION THRESHOLD   EXPANDED BAND SCAN

FREQUENCY LIMITS   FREQUENCY MARKER
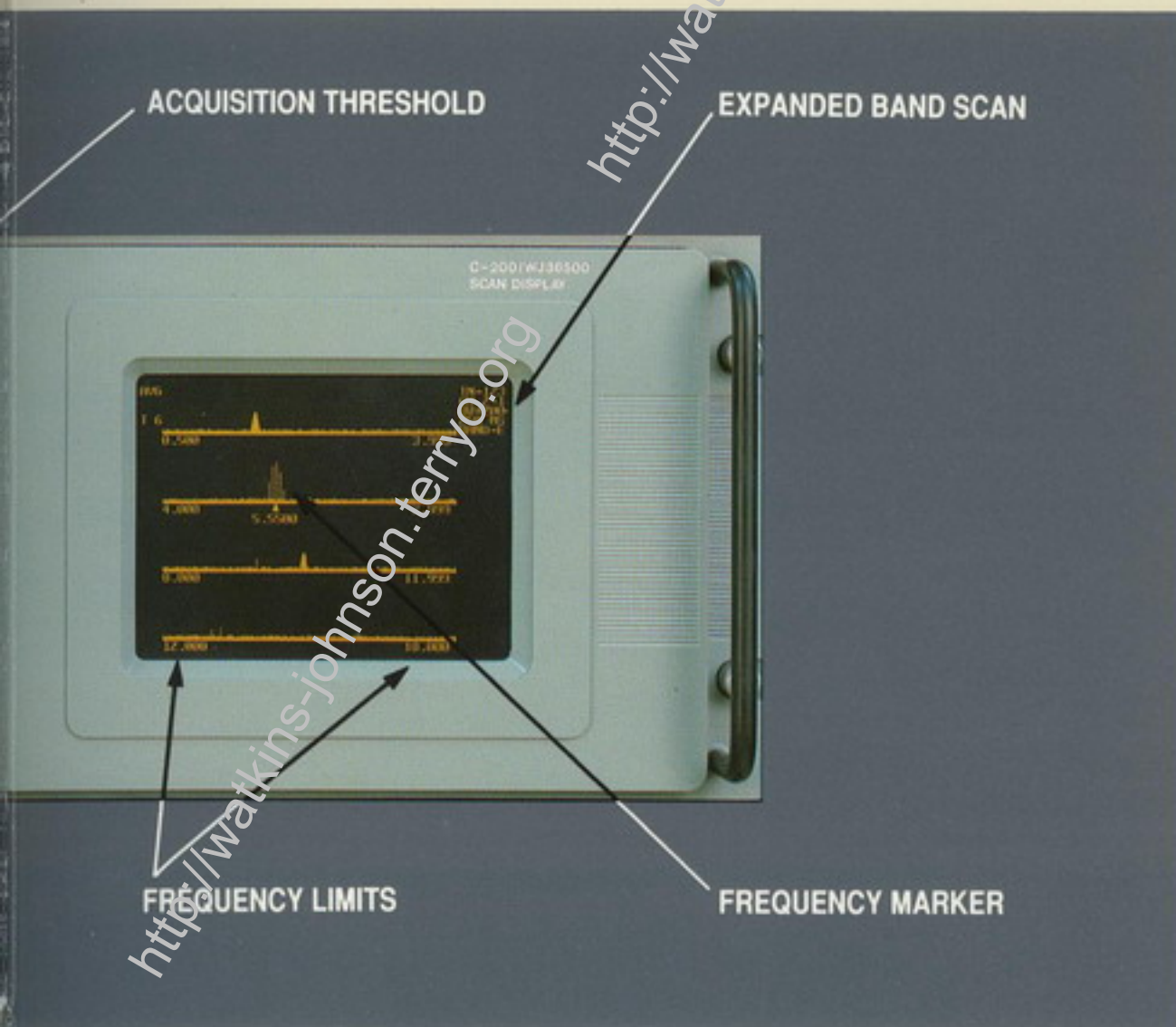
C-200 Scan Display

BITE

- Power Supply Voltage
- Phase-Locked Loops
- RAM/ROM
- Microprocessor
- Interface Busses
- Unit Temperature
- Signal Path Gain
- Frequency/Amplitude Accuracy
- Keypanel/Keyboard
- Disk Drive
- Video/Graphics Processor
- Remote Test Equipment Control

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C-100 Diagnostic Report

Communications

- **Flexible Interfaces**

IEEE-488	RS-232C
RS-422	MIL-STD-1553B
Fiber Optics	Ethernet

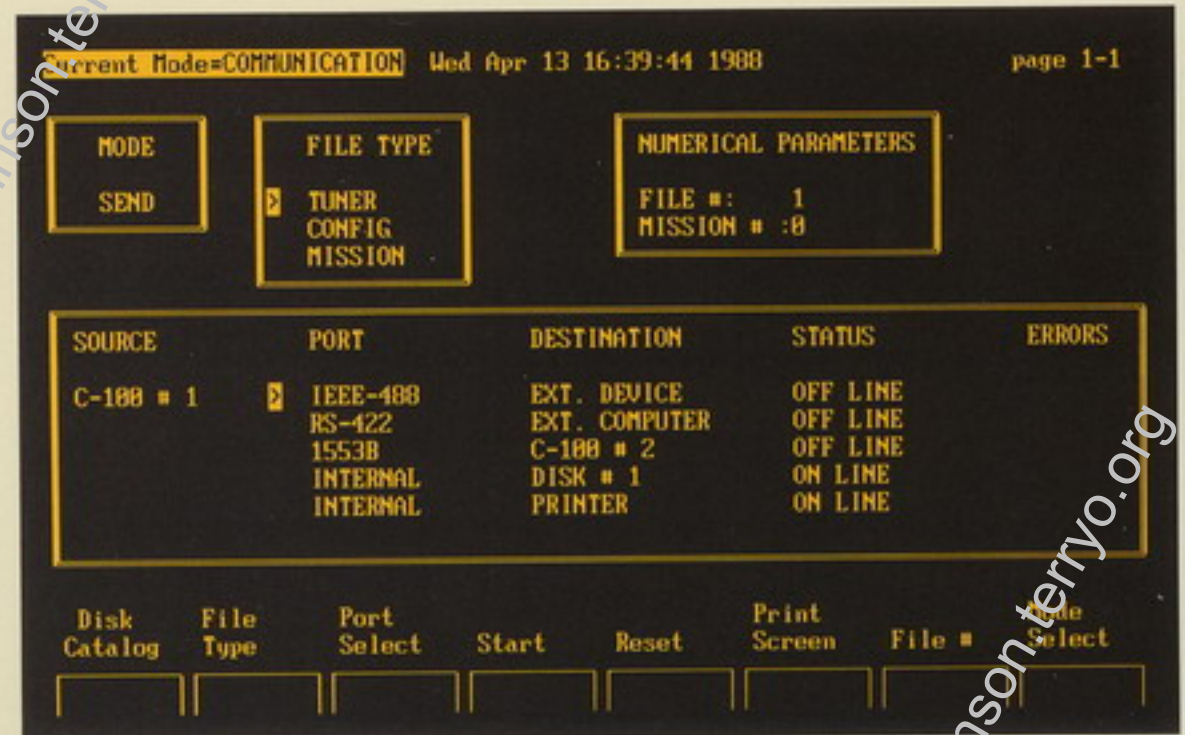- **Import/Export of:**

Spectral Displays	Status
Mission Scenarios	Operator Notation/Gist
System Configurations	Signal Activity/Logging
BITE Reports	

- **Storage Media**

Internal:	External:
Floppy Disk	Computer
Bubble Memory	Printer/Plotter
Hard Disk	Hard Disk

SIRS offers a wide variety of communications protocols, allowing easy access to most memory

C-100 Communications Menu

devices and providing the ability to input and output operational scenarios and setups. Hard-copy dump of any report screen, as well as panoramic displays, is possible via simple commands. These records may be saved internally or sent to an external storage device.

Demodulator/Equipment Frame Features

- **Multiple Selectable IF Bandwidths**

- **IF Attenuation**

- **Outputs:**

Log/Lin/FM Video	Audio
Selected Video	Aux IF
Filtered IF	

- **Five Slots per EF-100**

Internal Video Matrix	IF Switch Plug-Ins
Demodulator Plug-Ins	Special Purpose Plug-Ins

Demodulator plug-in type and quantity are chosen according to tuner characteristics and mission requirements. These units process the tuner IF outputs and provide the video information for the panoramic displays. Separate IF and video outputs for each channel in the system are available for recording/analysis. The system's wide variety of performance capabilities and powerful system architecture permit many custom set-ups. Special-purpose plug-ins can economically adapt standard systems to an individual user's custom requirements.

WJ-36500 Equipment Frame and Demodulator Plug-Ins

TUNER MODELS

MODEL	RF RANGE GHz	IF FREQ MHz	MAX IFBW MHz	REMARKS
TN-118A	0.5-18	160/400	50/200	General Purpose/Low Cost; Optional Synchronizer
TN-121	0.5-18	160/400	50/200	Consistent IF Spectrum; Dual Outputs; Phase Locked
TU-123	0.5-18	70/140/160	100	Ultra-Low Phase Noise; Programmable IF Center
TN-122	0.5-18	1000	500	General Purpose Wideband; Optional Synchronizer
TN-123	0.5-18	1000	500	Ultra-Low Phase Noise; Optional Dual IF Outputs; Phase Locked on Scan
TN-130	0.03-0.5	160	7.5	Lowband Extension
TN-100	0.3-0.5	160	7.5	Lowband Extension
TN-XXX	Octave	160	20	Standard Octave Bands; Existing Assets/Retrofits
FXT-1XX	18-100	n/a	10,000	Block Downconverters To 0.5-18 GHz Tuner Input
TN-218	2-18	160	50	Small Size Dual-Tuner
TU-XXXX	Various	160	40	WJ-8969 Miniature Tuners, 1kHz Synthesized Tuning

DEMODULATOR MODELS

FAMILY	IF FREQ	IFBW Range
MD-1XX	21.4 MHz	10 kHz-8 MHz
MD-2XX	70.0 MHz	10 kHz-20 MHz
MD-3XX	160.0 MHz	100 kHz-50 MHz
MD-4XX	400.0 MHz	5 MHz-200 MHz
MD-5XX	1000.0 MHz	25 MHz-500 MHz

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