ISA

Information Security Associates, LLC.

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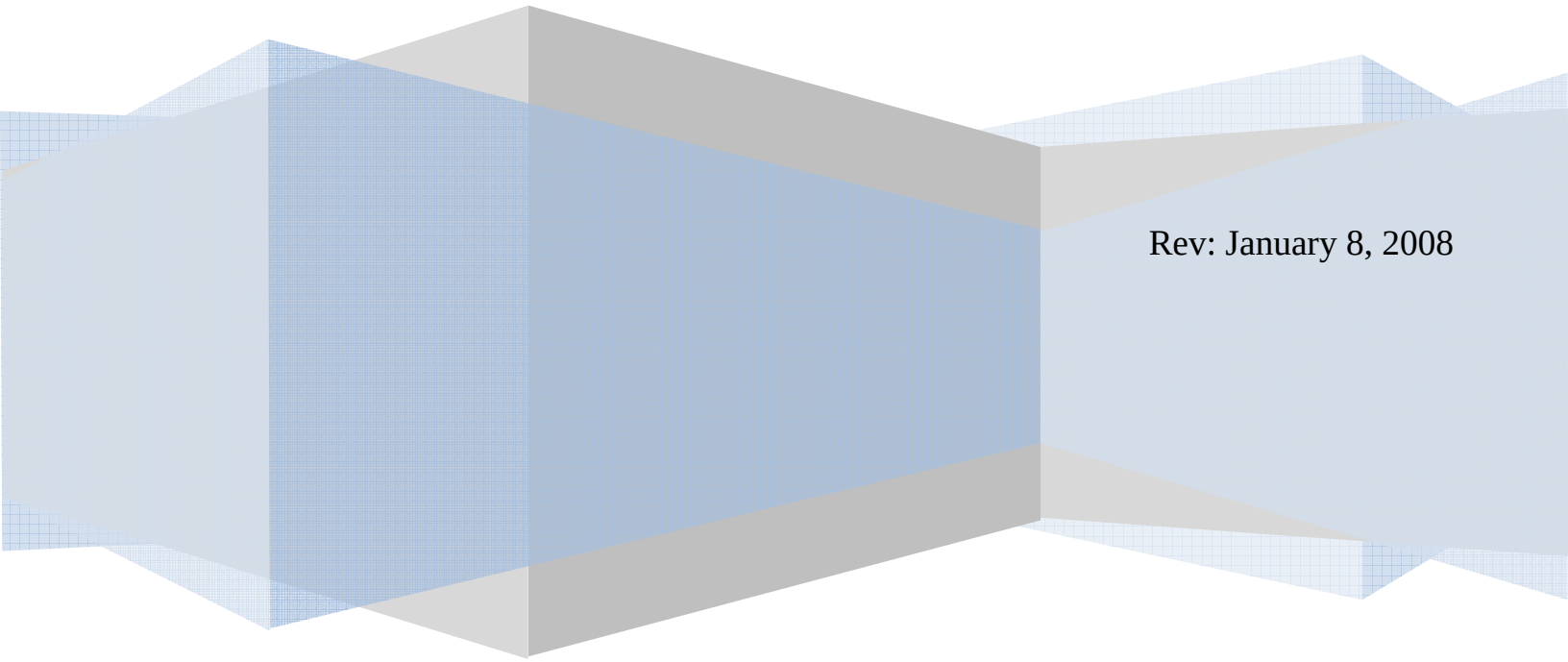
ECR-3 SMARTSCAN™
CoSpectra System

OPERATOR'S MANUAL



Rev: January 8, 2008

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Section 1

Introduction to SmartScan

The SmartScan System combines a laboratory quality Radio Frequency Spectrum Analyzer with computer control and sophisticated analysis to provide a system that detects RF bugs extremely accurately and efficiently without requiring an operator to have a strong technical background and without sacrificing RF sensitivity and detection range.

This manual covers the installation and operation of the SmartScan software. Refer to the ECR-3 Manual for instructions on manual operation of the ECR receiver.

1. System Overview

The ECR SmartScan is a software and hardware interface that enables ISA's ECR Countermeasures Receiver to be controlled from a laptop computer. The computer controls the starting frequency and ending frequency of the RF sweep and tunes the ECR through the radio spectrum. The computer logs all signals detected by the ECR by frequency and strength. Scan results can be saved to the computer's hard drive for comparison and reporting purposes. This system operates only with ISA's ECR-2* and ECR-3 receivers.

The ECR is a spectrum analyzer based transmitter detection system. To do a thorough detailed RF sweep, the accuracy and sensitivity of a spectrum analyzer always gives the best results. Spectrum Analyzers detect lower powered transmitters for greater distances than any other type of receiver. This means that a larger area can be swept and protected from one location, saving significant amounts of time and effort. Until SmartScan, however, spectrum analyzers required manual operation by a trained, skilled operator. RF sweeps were long and cumbersome, though they yielded superior results compared to other types of receivers. The ECR SmartScan automates the RF sweep so that the operator is free to do other tasks while the spectrum is examined by the system.

After the system completes the initial RF spectrum sweep, the operator is instructed to save the data collected during the scan and switch to the display on the computer that allows the evaluation of the detected signals. There, the operator will scroll through the signals and listen to each one for the presence of room audio. The computer tunes the ECR from one signal to the next at the click of a button.

This allows rapid analysis of the detected signals. Signals can be evaluated using FM and AM demodulators. An operator with only a few hours of experience with the system can identify a signal within a second or two and move instantly to the next signal. Typical scans detect between 250 and 400 signals. This means that the audio evaluation will generally take no more a few minutes compared to manual spectrum analyzer scans which can take upwards of 2 hours.

The ECR SmartScan system can also do a comparison of the signals detected during the current sweep to the signals detected on a previous sweep. It compares all of the detected signals and looks for ones that were not present on the previous sweep or ones that have increased in strength since the pervious sweep.

When analyzing the new sweep, the computer will display only the signals that meet these criteria. This can eliminate over half of the signals detected during the RF sweep.

*The ECR-2 is discontinued.

An RF sweep can be made outside of the facility that is being checked and saved for comparison. Another sweep can be made inside the facility and only the signals that are stronger inside the facility will be displayed. This same mode can be used in RF sweeps that are repeats of previous sweeps made moments, days, months, or years apart. Continuous monitoring of the RF spectrum for transmitters that turn on during a meeting is tremendously simplified. Many hours can be saved by organizations that do frequent repetitive sweeps of secure areas. This mode of operation is also a non-alerting method. No sound needs to be made in the swept area.

The SmartScan System includes automatic transmitter detection capability. AutoDetect Mode enables the computer to recognize a specific sound; one created by the SS-3 sound source. This mode silently demodulates all detected signals and analyzes each one for the presence of the sound being emitted from the SS-3 sound source. If the sound is detected, the operator will be alerted.

The ECR SmartScan runs on laptop computers that have Pentium processors. One Type II PC slot is required for complete operation. ECR SmartScan runs on Windows 95, 98, NT4.0, 2000, and XP.

Hardware Interface Card

The computer communicates with the ECR using a special card that is inserted into the laptop computer's PC slot. The card is a data acquisition card. This card enables the computer to silently evaluate demodulated signals for the presence of the special audio frequency used in AutoDetect mode and serves as the interface for the live room audio detection mode**. If AutoDetect operation is not going to be used, this card does not need to be used during the scan. The software to control the card must be installed during the original configuration, but the card is not required for program operation unless AutoDetect mode will be used.**

2. Installing SmartScan

The SmartScan system consists of two elements that are to be installed. Some notebook PCs do not have serial ports, so a Serial to USB interface is provided.

- SmartScan System software
- Data Acquisition Interface Card and software
- Serial to USB Interface

Software Installation:

Insert the SmartScan CoSpectra CD in the CD drive. If Autorun is activated on the computer, the installation should begin automatically. If it does not, click on Start, Run, Browse. Open My Computer and open the SmartScan ECR-3 folder in the CD drive. Select Setup.exe and click OK. Follow the instructions on the screen.

AutoDetect Card Installation

The AutoDetect feature uses a Data Acquisition card made by Keithley Instruments. The data acquisition card is Keithley KPCMCIA-AI12.

The software and drivers for this card must be installed before the card is plugged into the computer.

To install the software for the Data Acquisition card, click on Start, Run, Browse. Open My Computer and open the SmartScan ECR-3 folder. Then open the KPCMCIA folder. This folder has the Data Acquisition software. Select Setup.exe and click ok. Follow the instruction on the screen.

The AutoDetect interface card used with ECR SmartScan conforms to most Windows PCMCIA requirements. To use this card it is necessary to have PCMCIA Socket Support installed. If you are not sure whether PCMCIA socket support is installed on your computer, check for it by doing the following:

Open the **Control Panel** and double click on the System icon. Click on the Device Manager tab. A list of system devices installed on the computer appears. One of these devices must be named PCMCIA Socket. If you do not see this device listed, install it by using the **Add New Hardware Wizard.**

Install the software and drivers before inserting the card into the PC slot.

Insert the Data Acquisition Card into the PC slot.

The **New Hardware Found** dialog box opens when the computer detects the new card.
Click the **Driver from the Disk Provided by Hardware Manufacturer** option button. Click OK to continue and follow the instruction on the screen.

Serial-USB Interface

The ECR-3 has a serial connection for computer control. On the ECR rear panel is a female DB9 connector. A cable is supplied with the system for connection between the computer and the ECR. If the computer does not have a serial port, an adapter is provided. To install it, follow the instructions included with it. The installation CD may be required.

*Configuring the adaptor. After installing the adaptor and software, double check that the installation selected a usable COM port. Open **Device Manager** and locate the USB interface on the list of devices. Check its **Properties** and make sure it has chosen a low number for the COM port.*

3. Setting Up SmartScan CoSpectra

Computer Setup

After the program and software for the interface card has been installed in the computer, the system is ready to run an RF sweep.

If the AutoDetect mode will be used, insert the Data Acquisition card before starting the SmartScan program, otherwise, the card will not be recognized.

Connection of the AutoDetect card's interface cable is easiest if it is done before the card is inserted into the slot in the computer.

ECR Setup

Connect the AC power cord to the receptacle on ECR's rear panel and plug it into a 120 VAC outlet. The ECR is set at the factory for 120 VAC operation. If 220V power is used, refer to the ECR-3 Operator's Manual for instructions on power supply settings.

Connect the whip antenna to the RF input connector on the lower right hand side of the front panel.

NOTE: Electronic equipment containing digital sources creates RF noise across a wide spectrum. Noise signals can be detected coming from the computer and from the ECR. The signals are not very strong, so locating the antenna away from both of these sources significantly reduces the number of noise type signals that will be detected.

On the front panel of the ECR, push in the power ON/OFF switch. It takes approximately 10-20 seconds for the ECR to become operational. After a short self test the receiver will reset to 1000 MHz, the factory default power-on setting. Other factory settings include pre-set resolution bandwidth (RES BW), 10 MHz span, and 0 dB attenuation.

Connect the serial cable to the connector on the ECR's rear panel. Make sure it is seated firmly. Connect it to the Serial Port on the computer, or to the plug on the Serial-USB adaptor, if it is used.

If AutoDetect mode will be used, plug the data acquisition cable into the ECR's headphone jack. Turn the volume control fully clockwise.

If AutoDetect mode will not be used, connect the headphones to the headphone jack on the ECR. Turn the Volume down before listening to a signal.

If AutoDetect mode is not used, the data acquisition card does not need to be installed in the computer or connected to the ECR.

Starting SmartScan

Once the cable has been connected to the ECR and the computer, the SmartScan program can be started.

To start the SmartScan program, click on the SmartScan icon found in the Programs Folder of the Start Menu. You can create a shortcut to put it on the computer's desktop if you want.

When the Scan Screen is displayed, the system is ready to go.

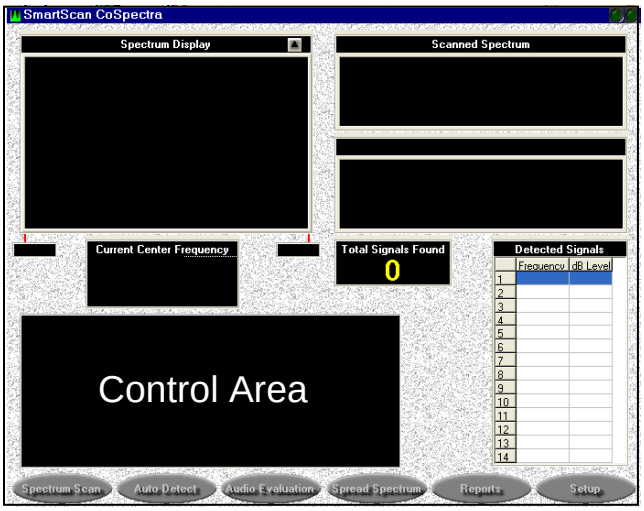
If you have not installed the AutoDetect card, you will get an error message stating ***"There was an error loading the DriverLINX driver for the Keithley AI12 card'.*** Click on OK and the program will finish loading. The lack of an AutoDetect card will not affect the performance of the system with the exception of not allowing AutoDetect scans.

Section 2

Using SmartScan

This section describes the various functions and operations of the SmartScan program. It identifies modes and operations and the functions of the displays and buttons. Section 3 will go into detail on the actual use of the system.

The first screen that appears when you are running the program is shown here.



Mode Selection Buttons

Across the bottom of the screen are 6 Mode Selection buttons. These are used to select the mode of operation for the required activity.

Move the mouse over one these selection buttons.

Note as it enters the button area, the text of the button changes from gray to green. When the button is clicked, the text changes to red, indicating that the selection is now active.

The black rectangle just above the selection buttons is the control area. Buttons for different functions and actions appear in this area. The content of the area will change depending on which mode button has been pushed.

The three black areas at the top of the display show spectrum displays.

Overview

The first operation in using SmartScan is to make a scan of the RF spectrum. SmartScan can do scans in two different modes. The first mode, *Spectrum Scan*, tunes through the RF spectrum and logs all radio signals. Once the scan is complete, the operator then listens to each signal in Audio Evaluation mode to determine if any are from an eavesdropping transmitter.

The second scan mode is *AutoDetec*t.

AutoDetect utilizes ISA supplied sound sources (Model SS-3). These sound sources emit certain audio frequencies. When a radio signal is detected by the system, it is demodulated and the audio is analyzed by the system for the presence of the SS-3 audio frequencies. If the frequencies are not present, the signal is ignored; if the SS-3 audio is present, the signal is added to the detected signal list for operator evaluation.

Another feature of the SmartScan system is the Spread Spectrum Detection routine. Spread Spectrum signals are almost always digital transmissions that are difficult for an unskilled operator to identify even using a manual spectrum analyzer. SmartScan CoSpectra evaluates signals throughout the RF spectrum, even signals that do not appear on the Detected Signal list. The detection routine creates a new list of signals that match the criteria of spread spectrum transmitters.

Hard copy reports are another feature. Report formats include graphic and table forms of hard copy information about the scanned spectrum.

RF Spectrum Scan - Manual Evaluation

This section describes the controls and settings required to do the RF spectrum scan.

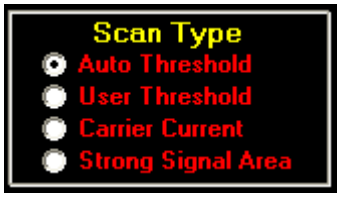
Spectrum Scan is used when the operator is planning on evaluating the scan by listening to the **demodulated audio** from the detected signals once the scan is complete. Do not use this mode for AutoDetect scans.

Click on the **Spectrum Scan** button to open up the controls required to set up and do the scan.

The operations of the Spectrum Scan mode are shown and described here.

Controls

Scan Type



SmartScan has four different scan types operational in the Spectrum Scan mode: *User Threshold, AutoThreshold, Carrier Current, and Strong Signal Area*.

AutoThreshold

AutoThreshold is the default mode. It sets up the system for the greatest sensitivity and the greatest detection range for low powered transmitters. The computer calculates the ambient RF noise level at each 2 MHz tuning step and sets a threshold above the noise. A signal has to be above this threshold to be detected and logged by the computer. This mode takes into account changes in the relative strength of the background RF noise level and is used for virtually all RF sweeps. AutoThreshold scans begin at a default starting frequency of 5 MHz and end at 1000 MHz. Starting and ending frequencies can be changed on a per session basis by the operator.

In AutoThreshold Mode, the horizontal red lines indicate the calculated noise level and the detection threshold. The system varies the baseline sensitivity so that increases in the ambient RF levels due to broadband noise do not end up being detected as signals.

When the scan is started, you will see two horizontal red lines in the Spectrum Display window. The lower line indicates the noise threshold calculated by the computer and the upper line indicates the detection threshold that a signal must exceed to be detected.

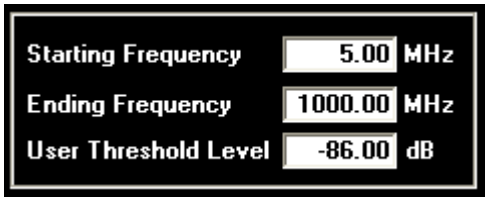
The detection threshold is shown in the **Threshold** window. This level corresponds to the upper horizontal red line in the spectrum display.

User Threshold

User Threshold allows the operator to set the level that a signal must exceed in order to be detected and logged by the computer, rather than having it calculated automatically by the computer. This mode can be selected when a very careful analysis of the RF spectrum is desired. A low threshold number will be input by the user. All signals above this threshold will be detected and logged. This mode will detect many more signals than AutoThreshold and most of the signals will be low level noise.

Only one horizontal red line will be seen on the spectrum display, indicating the detection threshold.

Starting Frequency



This is the frequency that the scan begins on. In AutoThreshold, User Threshold and Strong Signal Area Modes, the default starting frequency is 5 megahertz. The Starting Frequency for the Carrier Current Mode is 50 kHz (.05 MHz).

Changing the Starting Frequency. The starting frequency can be changed by the operator if a higher frequency is desired. To do so, double click on the number in the **Starting Frequency** box to highlight it, and then type in the new starting frequency. The new Starting Frequency will remain until changed or the program is closed. The system will return to the default Starting Frequency after the program has been closed and restarted.

Ending Frequency

This is the center frequency when the scan ends. The default ending frequency for AutoThreshold, User Threshold and Strong Signal Area Modes is 1000 MHz. In Carrier Current Mode, it is 5 MHz.

Changing the Ending Frequency. The ending frequency can be changed for high frequency scans only. It cannot be changed for carrier current scans.
Double click on the number in the **Ending Frequency** box. Type in the new frequency and press **Enter.** The new Ending Frequency will remain until changed or the program is closed. The system will return to the default Ending Frequency after the program has been closed and restarted.

Show Full Spectrum

This button lets the ECR display the full 1000 MHz spectrum the lower of the two small displays. This can be done before or after a scan is made. It can not be done during a scan. This feature lets the operator take a quick look at the entire spectrum at one time. It is a useful method of detecting strong local eavesdropping transmitters by recognizing harmonics or nearby strong signals.

See the section below on Secondary Displays for more details on how to use the Show Full Spectrum display.

Start

Click on this button to start the scan.

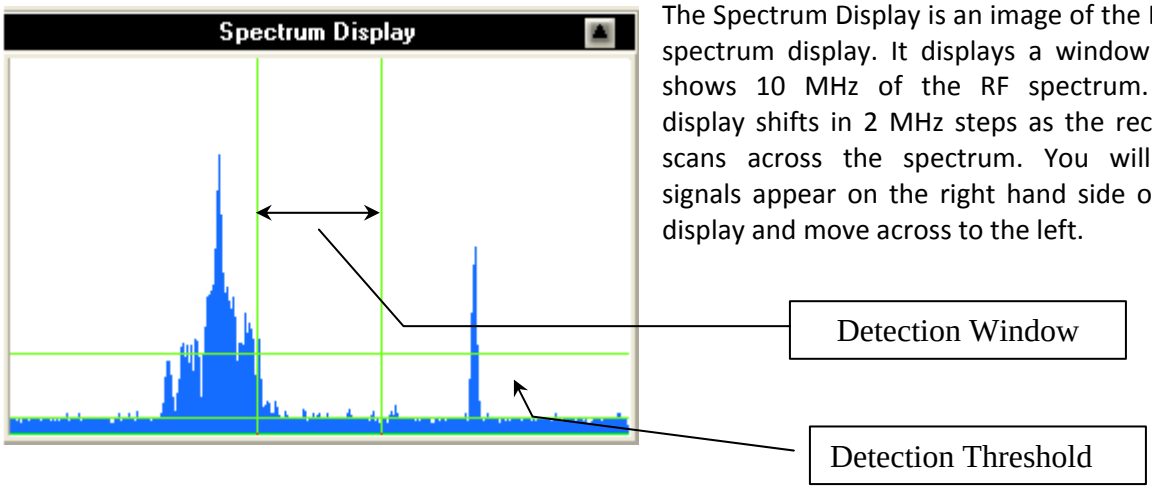
Stop

This button stops the scan in process if the operator wants to end the scan before it is completed. None of the changes an operator may have entered are changed when a scan is halted.

Displays

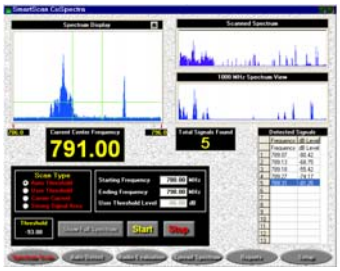
The Spectrum Scan screen has three displays of RF spectrum information

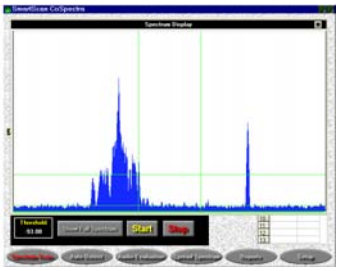
Spectrum Display



The Spectrum Display is an image of the ECR's spectrum display. It displays a window that shows 10 MHz of the RF spectrum. The display shifts in 2 MHz steps as the receiver scans across the spectrum. You will see signals appear on the right hand side of the display and move across to the left.

Changing the Display Size



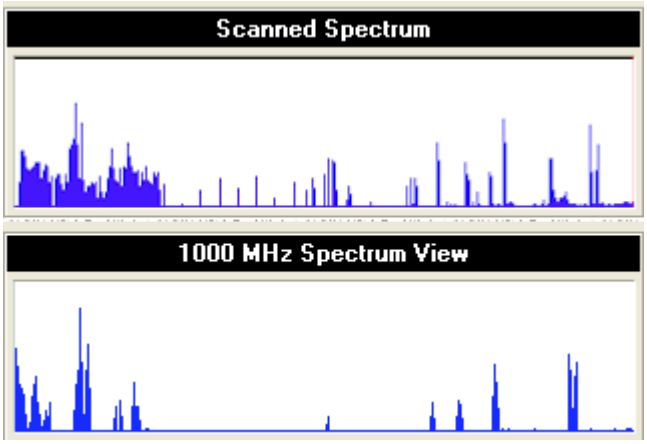


The button in the upper right hand corner of the display is to change the size of the Spectrum Display. Click on to increase the display to fill the width of the SmartScan program window.

To make it smaller, click again and it will return to its normal size.

The large display is shown on the right.

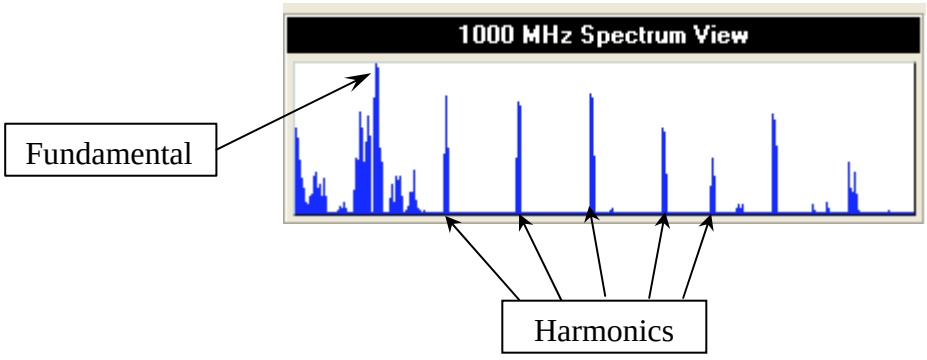
Secondary Displays



On the right-hand side of the computer screen are two smaller displays. The topmost display shows the entire spectrum as is it scanned. This display is built up 2 MHz at a time. The Scanned Spectrum Display shows signals as they are detected and it shows the progress of the scan.

When SmartScan is in Spectrum Scan mode, the lower display shows the entire spectrum at one time when the **Show Full Spectrum** button is pushed. The Full Spectrum Display can be selected before the scan is started or after it is complete, but not during. This display is intended to give the user an idea of how many signals are on the air, i.e., how crowded the spectrum is. It can also be used to take a quick look at the RF to see if harmonics from a nearby eavesdropping transmitter can be recognized.

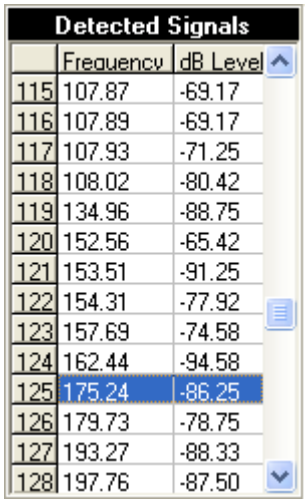
How can you recognize harmonics with this display? Frequently, you can get some clues regarding the RF spectrum from looking at the full span. Often eavesdropping transmitters are not sophisticated devices. For example, because of the simple design and a need to have a low power consumption to signal power ratio, they lack some of the circuitry of more sophisticated transmitters. One of the notable features of this type of transmitter is that it transmits a number of signals, called harmonics.



Harmonics are multiples of the original or fundamental frequency. For example, if a transmitter is at 120 MHz, harmonic signals will be seen every 120 MHz. So, you'll see them at 240, 360, 480 MHz and so on. They will show up as evenly signals on the Scanned Spectrum Display. Five harmonics can be seen in the illustration. Sound from the eavesdropping transmitter will be heard on most or all of the harmonics during Audio Evaluation.

Since the window size for this display is smaller vertically that the larger Spectrum Display, the signals will be somewhat different in appearance. The spectrum is compressed a bit vertically and the upper portion of the display is cut off. Thus, strong signals will go off the top of the display here, where on the Spectrum Display they are not off the screen.

Detected Signals



This is a table of signals that were detected and logged during the scan. The frequency appears in the left-hand column and the strength of the signal in -dBm appears in the right hand column. As the table fills, it scrolls down. The most recently detected signal is always displayed as the scan progresses.

In the dB level column, a small number indicates a stronger signal than a signal with a larger number. Signal number 120 is the strongest signal with a level of –65.42 dB. Signal 119 is the weakest, with a level of - 86.75 dB.

3. RF Spectrum Scan - AutoDetect Mode

The second method of making a scan uses the analysis capability of the computer itself to identify signals that are transmitting audio from the area of the sweep. In this mode, the system will detect the presence of eavesdropping transmitters within the area of the sweep.

The scan can be made using any of the four threshold modes: AutoThreshold, User Threshold, Carrier Current or Strong Signal Area. The only difference in the control area between Spectrum Scan mode and AutoDetect mode is the addition of the AutoDetect type selection box and the elimination of the Show Full Spectrum button.

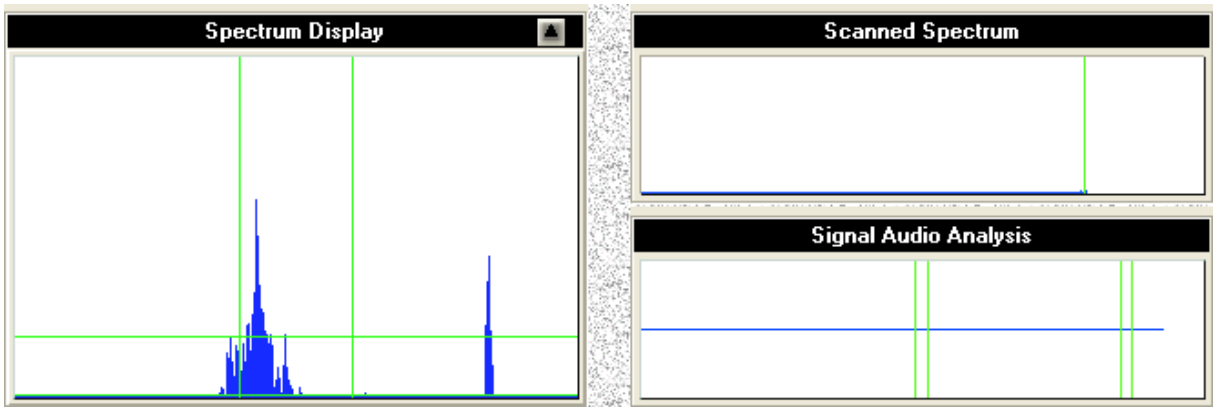
AutoDetect Scans

In this mode, the area is bathed with sound from the SS-3 sound sources. The sound emitted by the SS-3 contains special audio frequencies. Each signal that is detected is instantly demodulated by the system. The demodulated audio is evaluated by the computer for the presence of the SS-3 audio frequencies. If the computer detects the audio frequencies, the signal will be logged on the Detected Signals table. When the scan is complete, the signals can be evaluated in Listen Mode for actual room audio.

It will not be unusual to have several "false detect" signals discovered during this type of scan. A false detect signal is one that coincidentally has the same audio frequencies as those being produced by

the SS-3 sound sources. Some types of RF noise have components the produce the same frequencies. FM radio stations that are playing a piece of music that contains the frequencies will sometimes be detected, as will some paging and 2-way signals. A typical AutoDetect scan in an urban environment will show 10-15 signals at the end, rather than the 250-400+ signals detected by a regular spectrum scan.

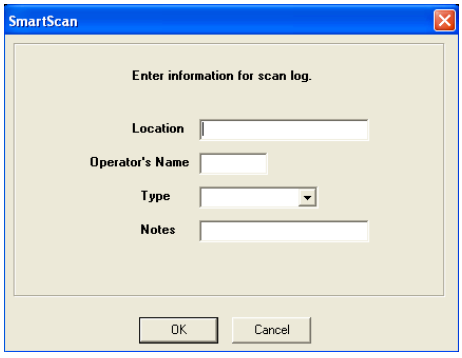
Scans made in AutoDetect Mode will take longer than regular scans. The evaluation of each signal takes about 1 second. If there are several signals in the detection window, the center frequency will not change until all of the signals have been evaluated. Typically an AutoDetect scan will require an additional 10- 15 minutes.
The AutoDetect scan display is identical to the Spectrum Scan. The Scanned Spectrum secondary display is also unchanged. However, the Full Spectrum secondary display used in Scan Mode has been replaced by a display that shows the demodulated audio.



In the illustration above, note the two small detection windows on the Signal Audio Analysis display. These windows represent the location of the sounds from the SS3 sound source. If the frequencies are present, the signal will be added to the list.

4. Saving Scan Data

At the completion of the scan the operator will be prompted to save the data collected during the scan. Additional information can be entered to help the operator locate the results of the scan in the future if it is to be used for comparison purposes or to print a report of the results of the scan.



To save a scan, click on the Yes button when the Save Scan Box appears. If you do not want to save the scan, click the No button.

NOTE: This prompt is the only opportunity you will have to save the data detected during the scan. If you want to save the scan, do it before switching to Audio Evaluation.

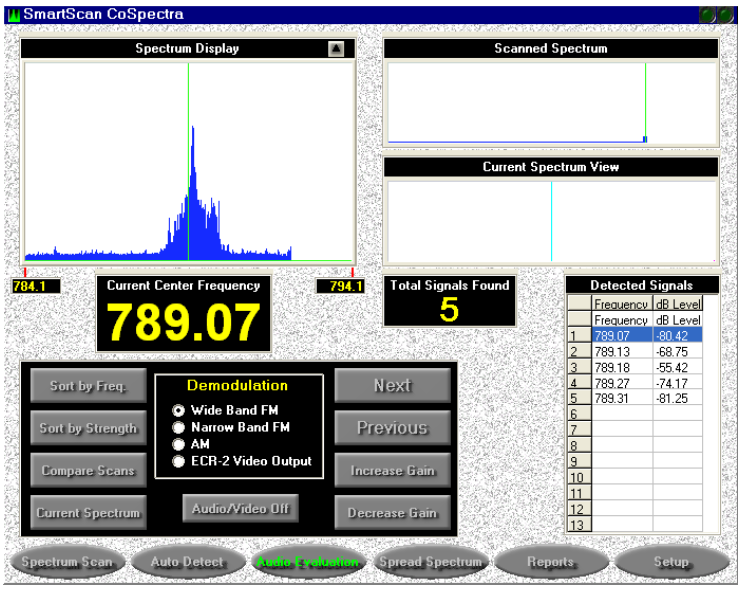
When you save the scan, additional information can be input as shown:

Field	Number of Characters	Use
Location	40	Record the physical location in the facility where the equipment, particularly the antenna, was placed. It is important to have the placement of the equipment as close as possible for accurate comparison scans.
Operator	12	Record the name of the operator.
Type	--	This is a drop down box giving a choice of the type of scan that was made: Carrier current or Higher Frequency. If an MDC-5 or MDC-4 range extender is used, the operator can note the frequency coverage of the range extender scan.
Notes	40	If the operator needs to make notes regarding the scan or its results, a document can be created in another application besides SmartScan. Reference to the document or its location can be input here.

5. Audio Evaluation Mode

After a scan has been made using Spectrum Scan or AutoDetect, Audio Evaluation is used to listen to the signals for the presence of sound from the area being swept. To start the audio evaluation, click on the **Audio Evaluation** button on the bottom of the SmartScan screen. The Audio Evaluation screen appears in the control area.

Signal audio will be heard immediately in the ECR's headset. This is the audio from the first signal in the Detected Signals table. Clicking on Next advances to the next signal in the list.



Click and listen to all signals until the evaluation is complete. Adjust the volume at the ECR.

Displays and Controls

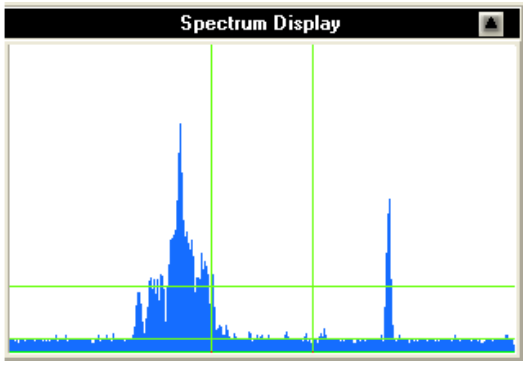
Total Signals Found

This is a numerical count of the number of signals detected and logged during the scan. It is the total quantity of the signals that appear in the Detected Signals table.

Current Center Frequency

This indicates the frequency that the receiver is currently tuned to. It is the frequency that is in the center of the spectrum display.

Spectrum Display

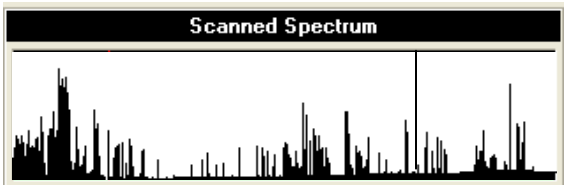


The spectrum display shown in Listen Mode is a composite of signals that were detected during the scan. It is not a real-time display. It shows the signals that were on the air and their amplitude when the scan was made.

This display may not be a perfect match to signals that are on the air while the scan is being evaluated since a signal that was detected and logged during the scan may have gone off the air by the time the scan is being evaluated. This is very common in two-way radio bands, pager bands, and in cellular bands. A signal that changes this way is not of concern. Eavesdropping transmitters will be on the air continuously if they are present during a sweep.

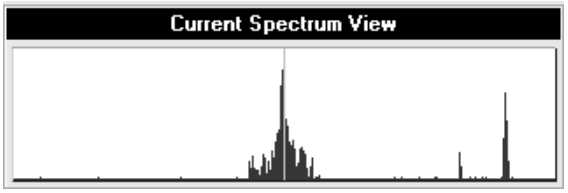
A strong signal detected during the scan that is not on the air during the audio evaluation is not a concern. If such a signal is encountered and is seen on the Detected Signals table, confirm that it is not on the air by glancing at the display on the ECR or by pushing the **Current Spectrum** button.

Scanned Spectrum Display



The Scanned Spectrum Display is a composite of all of the signals that were detected during the scan. It is like setting the display of the ECR to 1000 MHz with 9 kHz resolution bandwidth. It gives a snapshot of all of the signals that are on the air. The vertical red line indicates the position in the RF spectrum the ECR is tuned to.

Current Spectrum Display



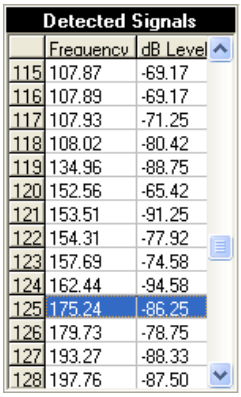
When evaluating a signal, there are times it is useful to see what the current display on the ECR looks like. When the **Current Spectrum** button is clicked, a 10 MHz slice of the spectrum based on the current center frequency will be shown in this display. With this display, the older signal can be compared to the

current display to see if, for example, the signal detected during the scan is still on the air. Use this feature if there is no recognizable audio from the signal being evaluated. Check to see if it is still transmitting by pushing the **Current Spectrum** button.

Current Spectrum

Clicking on this button displays the current real time 10 MHz view of the RF spectrum to the Current Spectrum Display as described above.

Detected Signals



	Frequency	dB Level
115	107.87	-69.17
116	107.89	-69.17
117	107.93	-71.25
118	108.02	-80.42
119	134.96	-88.75
120	152.56	-65.42
121	153.51	-91.25
122	154.31	-77.92
123	157.69	-74.58
124	162.44	-94.58
125	175.24	-86.25
126	179.73	-78.75
127	193.27	-88.33
128	197.76	-87.50

This is a table of signals that were detected and logged during the scan. The frequency appears in the left-hand column and the strength of the signal in -dBm scrolls down. The stronger the signal, the lower the dB number. The table has 14 rows, so 14 signals will appear in the list. Scroll down the table when doing an evaluation to see a complete listing of the signals. You can tune to a specific signal by clicking on it.

Order of Signal Display

SmartScan can display signals in the order they were detected (by Frequency) or in order by strength with the strongest signal first. Display by frequency order is the default setting. Here, the first signal in the detected signals table is the lowest frequency and the last signal is the highest. If Sort by Strength is selected, the signals will be listed by strength with the first signal being the strongest and the last being the weakest. Sorting by strength lets you check the strongest signals first. In the event that an eavesdropping transmitter is the strongest signal, it will be found faster.

Next

Click on this button to advance to the next signal in the Detected Signals Table.

Previous

Click on this button to go back to the previous signal in the Detected Signals Table.

Demodulation Types

The ECR has two types of audio demodulation which are controlled by the computer: Wide and Narrow band FM and AM FM is the default. Switching to the next or previous signal switches the demodulation to FM automatically.

Wideband FM has a 120 kHz bandwidth. Most analog eavesdropping transmitters are best heard in this setting. If the audio is not clear, switch to one of the other demodulation types.

AM demodulation. Click this if the audio has not been discernible on the FM settings. If the ECR is tuned by SmartScan so that it is slightly off the center of the signal, AM will give clearer audio. This is called *slope detection.*

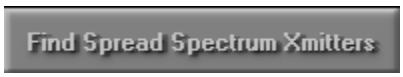
Note that video signals from television broadcasts are very wide and may appear on the Detected Signals table as several signals. The video signal will appear on the Spectrum Display as one signal, however. As the operator clicks on the Next Signal button, the video signal will move slowly across the center of the display.

6. Spread Spectrum Detection Mode

Spread Spectrum is a modulation technique that transmits data over a larger span of frequencies than would be used for a discrete signal. For TSCM purposes, you need to be able to identify each and every signal within the area of the sweep. Spread Spectrum transmitters are often difficult to identify because they appear to be weak and do not look like or demodulate like normal signals. Frequently, standard RF detection methods will not readily identify them. SmartScan has an analysis routine that looks for typical RF signatures of spread spectrum transmissions. It will identify signals that meet the criteria and show the waveform of the signal and its frequency. It also allows the operator to listen to the demodulated sound of the transmission.

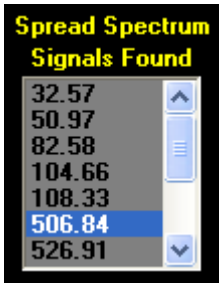
Spread spectrum transmissions are a relative rarity at present, but are becoming increasingly more common. They are used in data communication systems including wireless LANs, certain types of cellular telephone systems, and digital TV.

Displays and Controls



Click on this button to analyze the current spectrum for spread spectrum transmitters.

Signals Found



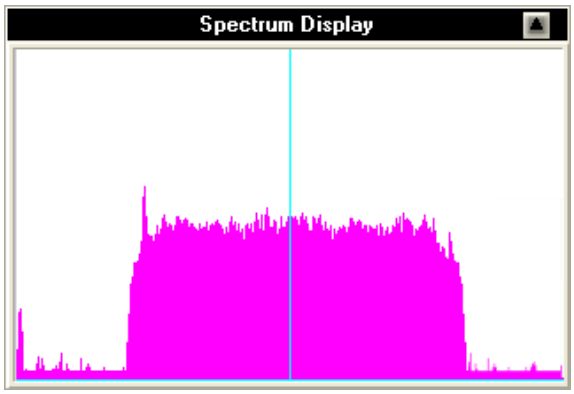
When the computer has completed the analysis of the scanned spectrum for signals that meet the criteria for spread spectrum transmissions, a list of frequencies appears here. The frequencies are the center frequencies of the detected signals.

Click on a signal in the list and it will appear in the spectrum display window.

Spread spectrum transmitters with a span of more that 2 MHz will frequently not be recognized during a normal spectrum scan. If the span is more than 2 MHz, the leading edge and the trailing edges will be detected during the normal scan. Look at the Signals Found table and you will see the transmission among those identified as spread spectrum.

The detection routine that SmartScan uses to identify spread spectrum transmissions is complex. In order to be certain to detect a variety of these types of transmitters, false detects are not uncommon. Due to the similarity in the shape of the two waveforms, strong video signals from nearby television stations are sometimes detected. So is broadband noise from PCs and other digital sources.

Spectrum Display



When in this mode, the display will show the selected spread spectrum signal. These signals frequently have a shape that looks like a mesa. It rises rapidly out of the noise floor and remains relatively flat across its span and then drops down quickly. Other spread spectrum signals will be more jagged and gradual in their rise and fall.

The signal shown in this example is a digital TV transmission.

Click on the arrow on the upper right hand comer to increase the size of the display. Click again to decrease it.

Virtually all spread spectrum signals are digital. Because they are digital, it is very difficult to turn them back into an analog signal that the operator can identify by sound. Therefore, elimination of specific spread spectrum signals as threats can only be done by measuring the strength of the signal inside the area being swept and comparing it to the signal strength outside of the area. It is stronger inside, it is emanating from the area being swept and must be located. Refer to the ECR operator's manual for instructions on how to find the transmission source.

Section 3
Working with SmartScan

1. Making and Evaluating Scans

SmartScan is used to make a scan of the radio spectrum in order to evaluate it for the presence of eavesdropping transmitters.

SmartScan divides the RF spectrum into three sections. First are low frequency signals. These encompass the entire LF (low frequency) radio band (30-300 kHz) and the beginning of the HF (high frequency) band (up to 5 MHz).

Second comes the continuation of the HF band (5 MHz through 30 MHz), the entire VHF band (30-300 MHz), and coverage of the UHF band up to 1000 MHz.

The third scan is of microwave ranges up to 7 GHz depending on the downconverter used.

Planning the RF sweep

The ECR is a very sensitive receiver. Its sensitivity is listed as -110 dBm. It is nearly as sensitive as receivers designed to be used on the specific frequency that a specific transmitter uses. In plain terms this means it can detect a low power eavesdropping transmitter for a good distance. Typical detection range for a low power eavesdropping transmitter is upwards of 100 feet. A signal from this type of transmitter at that distance will appear to be at least half an inch high on the ECR's display.

Let this signal strength determine how large an area can be swept from one site. Generally, the size of the area that can be adequately covered in one sweep is a circle 100 feet or less in diameter. This is a large area, covering approximately 3 1,000 square feet.

When choosing a location to do the RF sweep from and in determining the size of the area that can be swept, always keep in mind the location of a potential listening post. The hypothetical listening post location is the minimum distance a signal will have to travel to be outside of what could be described as the protected area. In determining the location, keep the following factors in mind.

- RF signals do not travel well between floors in an office building. This is because RF signals do not penetrate the steel and concrete used in typical office building construction. From this, we can infer that the listening post is likely to be on the same floor as the target or outside of the facility.

- If the area being swept is several floors above the ground, a fairly strong transmitter will be required to get the signal out of the building. If the listening post is on the same floor, a transmitter of less power will be needed. Keep in mind that the listening post probably will be needed outside of the area being swept, so you need to adjust your swept area size to be sure that you have set up the equipment a good deal closer to the transmitter than the listening post can be. This way the signal from the transmitter will always be stronger on the ECR.

The ECR is supplied with a low power test transmitter. This transmitter is a "worst case" example. Use it to scale the size of the sweep. Turn it on and find it with the ECR. Its approximate operating frequency is on a label near the battery compartment. If it is within a few feet of the ECR, it will be very east to locate, being a very strong signal.

Move it away from the planned site of the sweep until its signal is about 3/8" high on the ECR's display. This defines the maximum limit of the sweep. If this area encompasses all of the areas being checked, one sweep will suffice. If is does not, more than one sweep will have to be made.

The Basic Scan

The first action after determining the area of the scan is to make a basic scan. A basic scan is one where you have no previous scan information to compare with and where SmartScan's AutoDetect features will not be used. All detected signals will be evaluated by the operator for the presence of sound from the area being scanned. Regardless of frequencies covered, a basic scan must be made.

A basic scan is more thorough and accurate than the AutoDetect sweep, and requires more operator analysis time. It is even more thorough than a manual sweep using a spectrum analyzer because the SmartScan system picks out the signals and, with a button click, the operator can listen to each signal. A relatively inexperienced operator can identify a signal within one to two seconds. Typical scans detect between 200 and 350 signals. Evaluation time is, then, under 10 minutes. On the other hand, using a manually tuned Spectrum Analyzer will generally take upwards of two hours.

To Make a Basic Scan

- Set up the ECR as previously described.
- **Connect** the PC cable to the card. Take care when handling the PC cable connector. It is very small and somewhat fragile.
- **Insert** the PC card into the computer before turning it on.
- **Connect** the cable to the ECR

- **Start** the computer and start the SmartScan program.

A sweep should cover the entire RF spectrum. This includes very low frequencies (VLF) that carrier current transmitters use and frequencies up to 1000 MHz that the basic ECR covers and microwave frequencies detected by the MDC-4 or MDC-5 range extenders.

Carrier Current Scan

Begin with the carrier current scan. It covers frequencies from 50 kHz to 5 MHz.

Set up

Connect the carrier current adapter (P/N 41042) to the ECR RF input using the 3' coax cable supplied with the ECR.

Signals from all known carrier current transmitters can be found on the hot or the neutral wires in the AC cable. An adequate carrier current scan will check both of these wires.

Testing Telephone Lines for Carrier Current Transmitters

A telephone line can be used to carry low frequency radio signals just like an AC power line. Telephone lines can be tested with the system, also. One way to bring the RF into the ECR is to wrap the telephone line 5-6 times around the ECR's probe antenna. Another method is to connect the phone line using clip leads to the ECR's AC carrier current adapter.

If an ETA-3A telephone analyzer is used for telephone testing, connect the phone line to the ETA-3. Set its line selection switches to Positions 4 & 5. Connect the BNC-BNC cable used with the power line adapter to the Data Out connector on the ETA-3A and to the RF input on the ECR. Now make the scan.

Making the Scan

Click on the desired **Spectrum Scan** button. Select the appropriate **Scan Type.** Click on the **Start** button.

The scan will take 20-25 minutes to finish, depending on the speed of the computer being used. A carrier current scan will only take a few seconds, since only a small section of the spectrum will be checked.

When the scan is complete, you will be prompted to save the scan.

NOTE: This prompt is the only opportunity you will have to save the data detected during the scan. If you want to *save the scan, do it **before** switching to Audio Evaluation.*

Evaluating the Carrier Current Scan

Turn the audio level down on the ECR. Click on the **Audio Evaluation** button.

Audio from the first detected signal will be heard immediately. The default demodulation type is FM.

Plug the headphones into the ECR. Adjust the volume to a comfortable level.

For further analysis, click on AM.

Check the next detected signal by clicking the Next button. Proceed as above until all signals have been identified.

There is often a great deal of interference and electrical noise on AC Power lines. Sometimes it is difficult to discern transmitted room audio on signals being evaluated. Listen very carefully to try to hear what is on the signal being evaluated.

Pay close attention to signals between 200 and 300 kHz. Most commercially available carrier current transmitters operate in this range. These include wireless intercoms and "baby-sitters"

Best results will be obtained if a sound source is used in the area being swept.

High Frequency Scan

This scan checks frequencies from 5 MHz to 1000 MHz. Also, it is the scan type that is used if a range extender is used with the ECR.

Set up

Connect the remote antenna mount (PN 41162) to the ECR's RF input and attach the whip antenna to the mount.

All digital devices radiate RF energy. Many of the signals below 200 MHz detected in an office sweep are emanating from office equipment. This includes PCs, LAN and LAN wiring, fax machines, copiers, and electronic telephones. Notebook computers used with SmartScan and the ECR are digital devices, so they radiate RF, too, though the signals are weak.

The purpose of the remote antenna is to move the ECR's RF input away from these two signal sources, so the signals emanating from them will not be as likely to be detected.

Evaluating the Completed Scan

Turn the audio level down on the ECR.

Click on the **Audio Evaluation** button.

Audio from the first detected signal will be heard immediately. The default demodulation type is FM.

Adjust the volume to a comfortable level.

For further analysis, click on AM. If the signal is not exactly centered on the display, AM demodulation may give better results in discerning the type of audio being transmitted.

HINT: to turn the audio off, click on the **Audio Off** *button.*

Check the next detected signal by clicking on Next. The ECR is tuned to the next signal in the list. The demodulation automatically switches to Wide Band FM every time the system switches to a new signal.

Proceed as above until all signals have been identified.

Evaluating a Video Signal

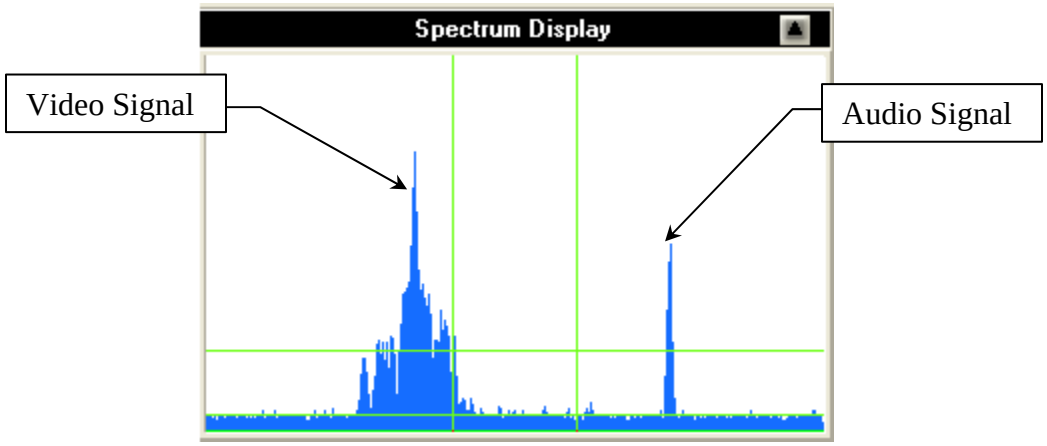
Video signals will be regularly encountered during a scan. Their sources are almost exclusively television stations. A video signal from a television station is not a threat and does not need special consideration once it has been recognized as **a** legitimate signal.

A video signal is an AM transmission. It sounds like a 60 cycle buzz. In Wide Band FM, there may not be much sound from the video signal, so switch to AM when evaluating a signal and the buzzing sound will be apparent. On the Audio Evaluation *control* panel, click on the AM button.

SmartScan's signal detection algorithm causes strong video signals to be detected several times. It may take 4-5 clicks to tune across a video signal. Once the signal has been identified as friendly, you can move to the next signal by clicking quickly to the next signal that is at least 1 MHz removed from the video signal or by scrolling down the list of detected signals and double clicking on the one that at least 1 MHz above the video signal.

The reason for multiple detections is that the signal detection algorithm has been designed to be able to detect "snuggled transmitters". A snuggled transmitter is one which has been tuned to be very *close to* another fairly strong signal. It will appear on most other RF detection equipment as part of the larger signal. In fact, most other receivers cannot separate it or demodulate it. SmartScan's detection technique allows these signals to be detected and evaluated at the cost of a few additional signals being detected during the scan.

Also, look at the spectrum display. A television station signal will look like this:



Commercial television broadcasts always have an audio signal transmitted at a frequency higher than the video (4.5 MHz higher for NTSC format and 6 MHz for PAL and SECAM formats). NTSC is the standard in North America and most of South America. Asia uses all three formats, depending on the country. European countries use PAL, except for France.

Check the detected signal table for signals above the suspected video signal by the correct amount. If there is an audio signal associated with the video signal and its demodulated audio is identifiable (that is, you recognize the sound as a TV show), the video signal will not be a hostile signal.

If you can not resolve the validity of the video signal by checking its audio component, you can display the video wave form on the ECR's CRT or use an audio analysis technique. See the ECR-3 Manual for instructions.

Scans Using Range Extenders

The ECR detects signals up to 1000 MHz. Traditionally, 1000 MHz has been the realistic ceiling for eavesdropping transmitters and almost all of the signals found during a sweep are below 1000 MHz. Developments in microwave technology, re-allocation of certain areas in the RF spectrum, the advent of PCS and other cellular and cordless telephones, and wireless networking have extended the concern about eavesdropping transmitters above the 1000 MHz ceiling.

To accommodate those, concerns, ISA has engineered a series of range extenders. The range extenders are external downconverters that change the microwave frequencies into frequencies that fall below 1000 MHz. This way these frequencies can be tuned through and any signals can be detected, logged and evaluated.

The MDC-5 extends the range of the ECR to 3000 MHz (3 GHz). It does so by converting 1-3 GHz down to 0- 1000 MHz.

The MDC-4 extends the range to 7000 MHz (7 GHz). It does so in three sections, each covering 2 GHz (1-3, 3-5, 5-7 GHz).

There are very few transmitters operating above 1000 MHz. Scans below 1000 MHz may detect several hundred signals. Scans from 1-3 GHz detect fewer than 20 signals. Since there are so few signals, some technicians prefer to check these frequencies manually to save time.

To do this, they set the ECR to a span where the entire 1000 MHz of its coverage is on its spectrum display and connect the downconverter. The few signals encountered will be very visible on the display. Then they can be tuned to and evaluated as in a normal manual RF sweep.

Using SmartScan, the operator can simply connect the downconverter to the ECR's RF input and make another scan. This will take approximately 25 minutes using the MDC-5 and I hour and 15 minutes using the MDC-4. Very few signals will be detected so evaluation time will be minimal and you will have a record of the signals so reports can be printed and comparisons made on future scans.

A scan completed using a downconverter can be saved just like any other scan. The ECR cannot tell, however, that a downconverter is attached and that it is detecting signals above the 1000 MHz range. Since the operator needs this information, it can be noted when the scan is saved.

On the user input information window that appears when the operator chooses to save a scan is drop-down box called Type. Clicking on its arrow displays a choice of scan frequency ranges. The 2 digit code next to the frequency range indicates the sweep range in Gigahertz. This two digit code also appears on the scan log listing. Scans using down converters can be identified by the code on the scan log.

Evaluate detected signals using downconverters the same way you would evaluate signals detected during a scan below 1000 MHz. Determine their type by the sound of the demodulated audio or by determining by signal strength that they are emanating from outside of the swept area.

2. Comparing Scan Results To Eliminate Duplicate Signals

A comparison scan lets the operator compare the signals detected on the current scan to those detected on a previous scan. Only signals that are stronger than those on the previous scan and signals that were not present on the previous scan will be displayed in the Detected Signal table in Audio Evaluation Mode after a comparison has been made.

Comparisons are made in Audio Evaluation Mode.
To do a comparison scan, perform a basic scan. **Save** the scan when prompted.
Click on **Audio Evaluation.**

When the Audio Evaluation panel appears, all of the signals detected and logged during the current scan will appear on the Detected Signal table. The operator can evaluate these signals in the usual manner by listening to each, if desired.
Click on **Compare Scans** to bring up a list of saved scans.
Double click on the scan that will be compared with the current scan or single click on it and click on OK.

The signals that are now seen in the Detected Signal Table are the new and different signals Evaluate them for the presence of room sounds like on other scans.

NOTE. Comparison scans must *start and end on the same frequencies. If they do not, inaccurate results may occur.*

External vs. Internal Scan

The comparison feature can be used to speed up the sweep in a facility. Use it to compare the signals inside a facility to those present outside of a facility. This is called an external scan and is made when you first arrive on site and is made outside of the area to be swept.

When comparing the results of the external scan to one made in the area being swept, only the signals that are stronger inside or not detected outside will be present. These are the only ones that matter. Any signal originating inside the facility will be stronger inside than outside, assuming that the ECR's antenna is closer to the transmitter on the inside scan and that there is no barrier between the transmitter and the ECR that attenuates the signal significantly.

The signals on the internal scan will include noise signals from computers and other electronic equipment, so there always will be a number of signals on the comparison sweep. There may also be some strong signals that were not on the air when the external scan was logged. These will include cell phones and paging and two-way radio transmissions. The majority of the non-noise signals that appear on the comparison will be in only a few bands.

To do the external scan, pick a location at least 500 feet away from the area that will be scanned inside the facility. Any eavesdropping transmitter will be a weak signal this far from its source. It may be strong enough to be detected and logged and its audio could be heard from the point of the external scan.

Next, move the equipment inside the facility. Make another scan, save it, and compare it with the scan *made* outside. The signal from the eavesdropping will be significantly stronger than it was on the external scan.

Multiple scans within a facility

If a sweep covers an area larger than the ECR can cover in one scan or if there are areas on more than one floor, more than one scan will have to be made. The first scan can be a basic scan or it can be one that has been compared to an external scan. The point is, the first scan in the facility must be done in a manner such that the operator has identified all of the signals in the facility. This first scan serves as a baseline for what will become the comparison.

To do subsequent sweeps, relocate the ECR to the next area to be surveyed and run the necessary scans: carrier current, high frequency and range extender (if used).

Use the comparison feature after the new scan has been completed and saved. Only *the signals* that are new or stronger than on the other scans will remain on the detected signal table for evaluation.

Multiple Comparisons

If the sweep has a number of scans due to the size of the area or because of multiple floors, two or more levels of comparisons can be made to eliminate many duplicate signals whose strengths may be higher or lower at different parts of the facility being swept.

To do multiple comparisons after completing a scan, click on the **Compare Scans** button and select the scan to be compared against as described above. Then select **Compare Scans** again and select the second scan to be used in the comparison. SmartScan will then use the results of the first comparison as the baseline sweep and eliminate any duplicates using the selected sweep. You can do this for as many scans as there are of a facility.

Continual monitoring of a site.

There are instances where a meeting room will need to be under continual observation to detect any signals that might turn on during a meeting. Threats in this situation include:

- Transmitters carried in by a participant
- Transmitters brought in with meeting equipment
- Wireless microphones used on the AV system
- Transmitters already in place and remotely activated
- Transmitters operated by building control systems such as lights, HVAC, etc.
- A cell phone activated by a participant
- A cell phone configured for auto-answer

SmartScan makes continual monitoring very easy. Previously, multiple RF sweeps would be made on a periodic basis. This becomes very tiresome for the operator with the result being a strong probability that a signal might be missed due to operator fatigue.

With SmartScan, the operator merely performs the scan and compares the current scan with the most recent one that had been saved.

A baseline is developed using the first scan in the facility. The next scan in the continual monitoring process will be compared to this. The next will be compared to the second, and so on. It will become likely that the operator will only have to evaluate only a few signals on each comparison.

Remember, to be used as a comparison scan, the scan MUST be saved before switching to Listen Mode.

HINT- Antenna location is important when planning the sweep. If you are doing a repeat sweep of a site and are planning to compare against the original sweep, to get the most accurate results, make sure the antenna is in the same exact spot as it was for the original sweep. Signals may be at slightly different levels at a location only a few feet away.

This difference is not significant enough to have any affect on the ability of the equipment to detect an eavesdropping transmitter. It will have enough of an affect, though, to make the comparison less accurate, since the comparison looks at signal strength as a primary indicator of new or stronger signals. If a previously detected signal is slightly stronger because of antenna placement, it will not be eliminated during the comparison.

When saving a sweep, be sure to include enough information in the Location or Notes sections to identify the antenna location for subsequent sweeps.

3. Saving Scans and Managing Saved Scans

The ECR SmartScan can store the results of a scan on the computer's hard drive. This allows the operator to use the Compare Scan feature in Audio Evaluation mode to eliminate duplicate signals that appear on both scans. It also allows the operator to print a list of the signals and signal strengths that were detected during the scan.

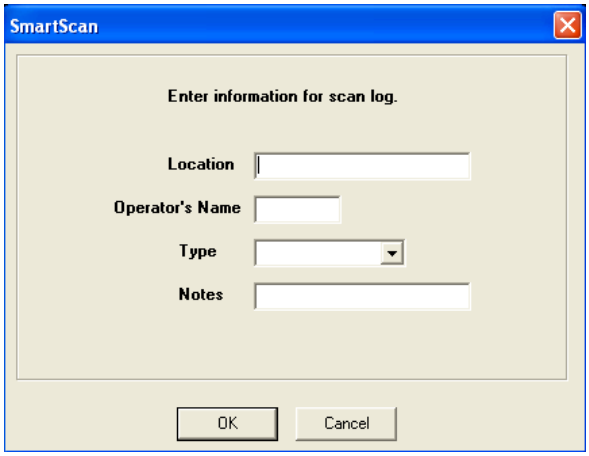
NOTE: The opportunity to save the scan is only presented once at the end of the scan. If the scan is not saved then, it can not be saved later.

The only limitation to the number of scans that can be saved is the size of the computer's hard drive. Scans do not take up much room on the hard drive, usually less than 500 KB per scan, so literally thousands can be stored.

Managing the data takes some planning if scans will be stored or reused at some time in the future.

Saving a Completed Scan

The following figure shows the form for inputting operator data about the scan. Move from field to



field using the tab key or by clicking on the appropriate field with the left mouse button.

Pressing the **Enter** key will immediately save the scan regardless of the stage of completion of the information on this screen. Do not try to move from field to field with the enter key. Pressing **Enter** will save the scan with the information uncompleted.

Location This field is to identify the location of the scan. It is 40 characters long. Type in the details of the location. Include name of company, floor number, office identification and location of antenna. With some thought, this can be squeezed into 40 characters.

When saving a scan that might be used for future comparisons, it is important to note as specifically as possible the location of the antenna during the scan. Do not identify the location just by the name of the occupant of the office. Include enough description so the site of the scan can be located even if the office is occupied by a different person in the future.

Operator's Name

This field is for identifying the operator who made the scan. It has room for 12 characters

Type
This drop-down box is for identifying the type of scan that was made by its frequency range.
Clicking on the menu button brings up a list of types of scans as shown at left.
Click on the type of sweep to put in the Type field.

If the wrong one is selected by mistake, click on the menu button again to bring up the list one more time and select the correct scan type.

If an MDC series range extender was used during the scan, it is important the proper scan type be selected so the correct frequency ranges can be compared in the future.

Notes
The Notes field is 40 characters. It can be used for brief notes on the results of the scan or to continue with more detailed information of the location of the scan.

When the information has been completed, press the **Enter** key or click on OK.

When a scan is saved, SmartScan creates a new file containing information about the signals and strengths. These files can be found in the SmartScan folder in the Programs folder.

The first time SmartScan saves a scan, it begins to keep a list of scans in a file called Scan Log, also located in the SmartScan folder.

Scan Log
Scans are shown in the Scan Log chronologically by date and time. When a scan is saved, Scan Log automatically includes the date and time of the completion of the scan as well as the actual starting and ending frequencies. It also shows the data that was input by the operator when the scan was saved. The last series of numbers indicate the name of the data file that contains the scan data.

Date and time are saved in a DD MM YYYY format, so the day will precede the month.
This sample shows four scans.

25/11/06 14:03 KBS- Ritz Residences, PH3	Muessel	0-1	5	1003	Antenna by util closets	25110614.03 Found: 196
14/12/06 14:01 KGS- New York	Lewis	0-1	779	797	Antenna in Boardroom Foyer	14120614.01 Found: 4
14/12/06 14:13 KGS- New York	Lewis	0-1	779	791	Antenna in CEO's Conf. Room	14120614.13 Found: 8
14/12/06 14:13 KGS- New York	Lewis	0-1	779	791	Antenna Center of 22nd fl exec area	14120614.13 Found: 9

The scan log can be viewed from Set Up mode by clicking on the **View Scan Log** button. It can be viewed from Audio Evaluation mode by clicking on the **Compare to Previous** button.

Managing the Scan Log

Saved scans can be deleted from the list that appears on the scan log. The saved scan file name (the last field in the entry) references a file containing the saved scan information. The delete function will delete this file. Once a file is deleted, it cannot be recovered.

The only time you might want to delete a scan is if the list of saved scans grows too long and is cumbersome to scroll through. Saved scans do not take up a significant amount of memory and have no affect on the operation of the program.

To delete a scan, click on the **Setup** mode button. Click **on** the **View Scan Log** button. Scroll down to the scan to be deleted. Highlight it and click on the OK button. Only one scan at a time can be deleted. To delete another, highlight it and click on delete. When the scans have been deleted, click on close.

If a SmartScan system is used a great deal, the quantity of saved scans and the length of the Scan Log can become cumbersome from a user standpoint. The Scan Log and the saved scans do not take up much room on the hard drive, so system resources are not a concern. However, finding a scan in a long list in the Scan Log might be tiresome. Remembering a scan by date, time and location will be a great help in finding a scan on the scan log.

For users who have continuing responsibility for several sites that will be scanned frequently, it may make more sense to keep a copy of the scan log and its associated scans in a separate folder for each site. This way when a scan will be made of one site, its scan log and saved scans can be copied to the SmartScan folder and the new scans will be added to the scan log that contains the records of that particular site. When the work is completed at the particular site, copy the scan log and saved scans back to the "storage" folder that was created for that specific site. Using this technique will make it easier to find specific scans for comparison.

If you use this technique, be sure to remember to rename or move the current Scanlog.dat file in the SmartScan folder before moving or copying the one kept in the specific storage folder. If it is not renamed or moved, the current Scanlog.dat file will be replaced by the other one and all of the scans in the current folder will be lost.

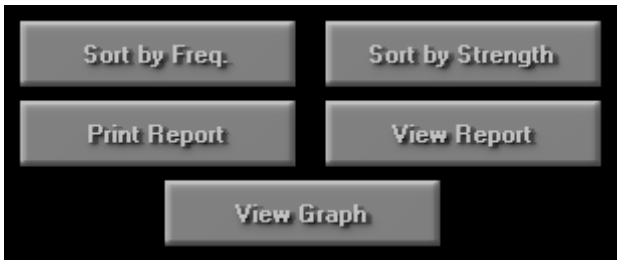
Note: *If the scan log file has been deleted or moved from the SmartScan folder, SmartScan automatically creates a new (and empty) scan log file when the first scan is saved There is no way to move a saved scan from one scan log file to another.*

Sweep services that work for several large clients or end users who do frequent sweeps of their own facilities may want to store the information in a similar manner.

4. Creating Reports

Overview

Click on the Reports button to open up a set of choices for making and printing reports of saved scans. The Report Control Panel is shown below.



SmartScan offers different types of report formats The first is as a listing of the frequencies and strengths of all of the detected signals. The second is a graphic representation of the RF spectrum that can show the entire spectrum up to a span of 1000 MHz or a selected portion as narrow as 10 MHz.

It is unlikely that you will print a report in either format at the time you are doing a sweep. Therefore, any scan that was saved can be printed later. Remember to save scans when the scan is completed because this is the only time the data from a scan can be saved.

Frequency List Report

The frequency List report shows the following information: Scan Date and Time, Location, Scan type, Report Date, Operator Name, and Notes.

SmartScan
Detected Signal Listing

Scan Date:	25/11/06	Scan Time:	14:03
Location:	KBS- Ritz Residences, PH3	Scan Type:	0-1
Report Date:	14/12/06	Operator:	Muessel
Notes:	Antenna by util closets	Page 1	of 3

Sig. No.	Frequency	Strength	Sig. No.	Frequency	Strength	Sig. No.	Frequency	Strength
1	14.53	-88.33	31	31.96	-78.75	61	91.85	-86.67
2	15.15	-90.00	32	35.96	-89.58	62	91.89	-79.58
3	17.17	-92.08	33	39.96	-87.92	63	92.45	-84.17
4	17.26	-87.50	34	47.96	-82.50	64	92.70	-81.67
5	17.70	-89.17	35	53.96	-70.42	65	92.74	-83.75
6	17.78	-87.08	36	55.28	-76.25	66	92.88	-60.42
7	18.21	-89.17	37	59.74	-88.33	67	92.94	-84.58
8	18.29	-85.00	38	59.96	-80.00	68	93.27	-82.50
9	18.54	-86.67	39	67.24	-82.08	69	93.59	-71.25

Frequency listing reports can list signals by frequency or by strength. To list by frequency, do nothing; sorting by frequency is the default setting. To sort by strength, click on **Sort by Strength**. To change back to frequency, click on **Sort by Frequency**.

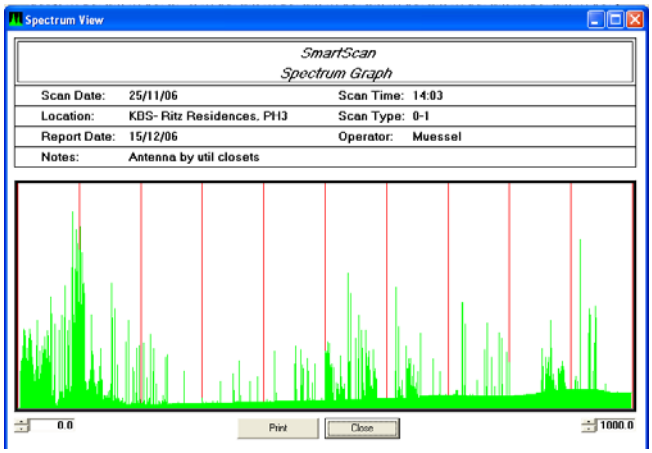
To preview the report, click on **View Report**. You can scroll through the report to view the listings. To close the report, click on the **X**. You must close the report preview to return to the program or to print.

To print the report, click on **Print Report**.

Spectrum Chart Report

A chart of radio spectrum can be created here. In its default state, the chart will show the full 1000 MHz that the system covers, regardless of the actual frequencies scanned. The same details about the scan mentioned above will be displayed in the report header.

A spectrum Chart Report looks like this:



Note the numbers on the lower left and right corners of the graph. These show the frequencies of the edges of the report.

The vertical lines indicate 10 divisions of the span shown on the chart.

The default, as mentioned, is a span of 1000 MHz, even if less than 1000 MHz was covered in the scan. The amount of the spectrum displayed on the chart is changeable. On either frequency selection box, click on the up or down arrows to change the frequency. Or double click to highlight the number and type in the frequency desired. Press **Enter** to make the change. The minimum width is 2 MHz. A width of 10 MHz will duplicate the main spectrum display. The frequency on the left must be lower that the one on the right.

If there is a section of the spectrum that is of specific interest, or if there is one specific signal that you want on the chart, or if a scan of less than 1000 MHz was made, you can select a range of frequencies that is less than the 1000 MHz span shown on the default graph. You can use this feature to build a magazine of the waveforms of various types of signals you have identified.

To close the preview, click on the X. You must close the report preview to return to the program.

Selecting a Scan to print.

If you have closed the program since the scan was made, you will have to select and load the scan you want to print from the list of saved scans.

To select the scan:
Click on the **Set Up** button on the bottom of the display.
Click on **Open Previous Scan.**
Scroll down the list of saved scans to find the one you want to print. Highlight it and click on **OK.**
Now click on **Reports** and select the report format you wish to view or print.

Comparison Reports

You can print a report that is the result of comparing two scans. If you have made two scans in the same location and want a listing of the signals that are different on one of the scans, do the following.

Select the first scan. This is the scan that will be compared against, the one you want to know what is different than on a previous scan. Select it in the **Setup** by clicking on **Select Previous Scan,** highlighting the scan you want and clicking on OK.

Click on **Audio Evaluation** button to switch to Audio Evaluation Mode. Click on **Compare Scans** and select the scan to compare against. Click **OK** to make the comparison.

This differential report feature is only available on the frequency listing. The spectrum graph report does not eliminate duplicate signals. On the spectrum graph, only the entire scan will appear. Duplicate signals are not eliminated and the entire spectrum will be printed.

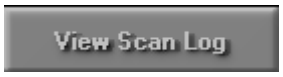
5. Setup Mode

Setup is the section the program where you can select a scan to be the source for reports, select scans to be deleted from the Scan Log (the listing of saved scans), and change certain settings in the operation of the program.

Open Previous Scan

This button displays a list of saved scans to allow one to be selected as the current scan. Reports based on this scan can now be printed.

View Scan Log



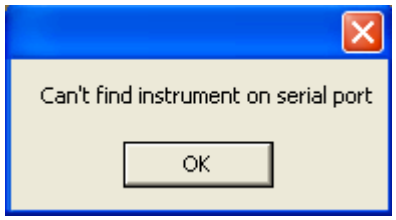
This button displays a list of saved scans. Saved scans can be deleted here one at a time. Delete a scan by highlighting it and clicking on Delete.

Edit Config File

The config file contains various settings that control certain performance parameters of the system. It can not be accessed by the operator. It is intended for use with factory technical assistance.

6. Problem Solving and Troubleshooting

1. **Error Messages**

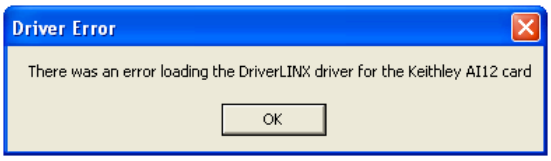


This error message indicates that the SmartScan system is not communicating with the ECR. They are displayed for one of the following reasons:

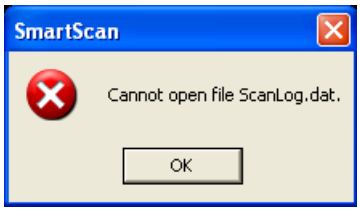
a. The cable from the ECR to the computer was not connected properly. Check to make sure that it is firmly connected.

b. The ECR is not turned on or power to it has been interrupted.

c. The COM port setting on the Serial USB Interface is set at too high a number.



This error message indicates that the data acquisition card needed for AutoDetect mode is not present. It does not need to be installed unless AutoDetect mode will be used. If AutoDetect will not be used, click on OK. If AutoDetect mode will be used, click on OK close SmartScan and any other programs that may be running, turn off the computer, make sure the data acquisition card is inserted into one of the PCMCIA slots of the computer and restart the computer.



This error message occurs when you click on the **View ScanLog** button on the Scan Screen or when you click on **Compare Scans** in Audio Evaluation mode before any scans have been saved. SmartScan does not create the scan log file until it saves the first scan. Click **OK.** When the Scan Log window opens, click on Close and continue using SmartScan.

2. **Troubleshooting**

1. Cannot change user threshold level.

To change this level, User Threshold has to be selected in the Spectrum Scan control panel. Click on **User Threshold.** Now the User Threshold Level can be changed.

2. The audio from the signal should be clear but it is distorted.

Try one of two things: If the signal is an FM signal, and the ECR is not tuned exactly to the center of the peak, good audio can usually be heard by clicking on the AM **Demodulation** button.

If the audio is not clear, the ECR may be manually tuned to the exact center of the signal. (See 3. below.)

3. Overriding SmartScan control of the ECR.

There are rare times when the operator needs to override the computer and manually control the ECR. One time might be when there is a weak video signal or a video signal at 2.4 GHz, or when trying to get recognizable audio out of a signal. Both of these functions involve fine tuning a signal if it is not in exactly the right spot.

To take control of the ECR, use the small control box. This will allow interruption of the SmartScan signal.

4. AutoDetect Scan shows no detected signals.

It is not unusual to have very few signals detected on an AutoDetect scan. It is unusual if NO signals are detected. If none are detected, make sure the audio jack from the AutoDetect card in the computer is plugged into the headset jack on the ECR front panel and that the ECR's volume is turned all the way up. Repeat the scan.

5. AutoDetect shows many detected signals.

If the volume on the ECR is not set all the way up, almost every signal that is analyzed will be added to the detected signal list. This is because you are only getting raw noise and this contains almost all audio frequencies. If you forgot turn the audio all of the way up, click on **Stop,** adjust the volume all the way up, and repeat the scan.

Warranty

Information Security Associates, LLC. warrants that the diskettes on which the software is recorded and the printed documentation are free from defects in material and workmanship for a period of 90 days from the date of receipt. PCMCIA interface cards are warranted to be free from defects in material and workmanship for a period of one year from date of receipt. Cables are warranted for to be free of defects in material and workmanship for a period of six months from date of receipt. Your sole remedy is replacement of the defective diskette, documentation, PCMCIA card, or cable.

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