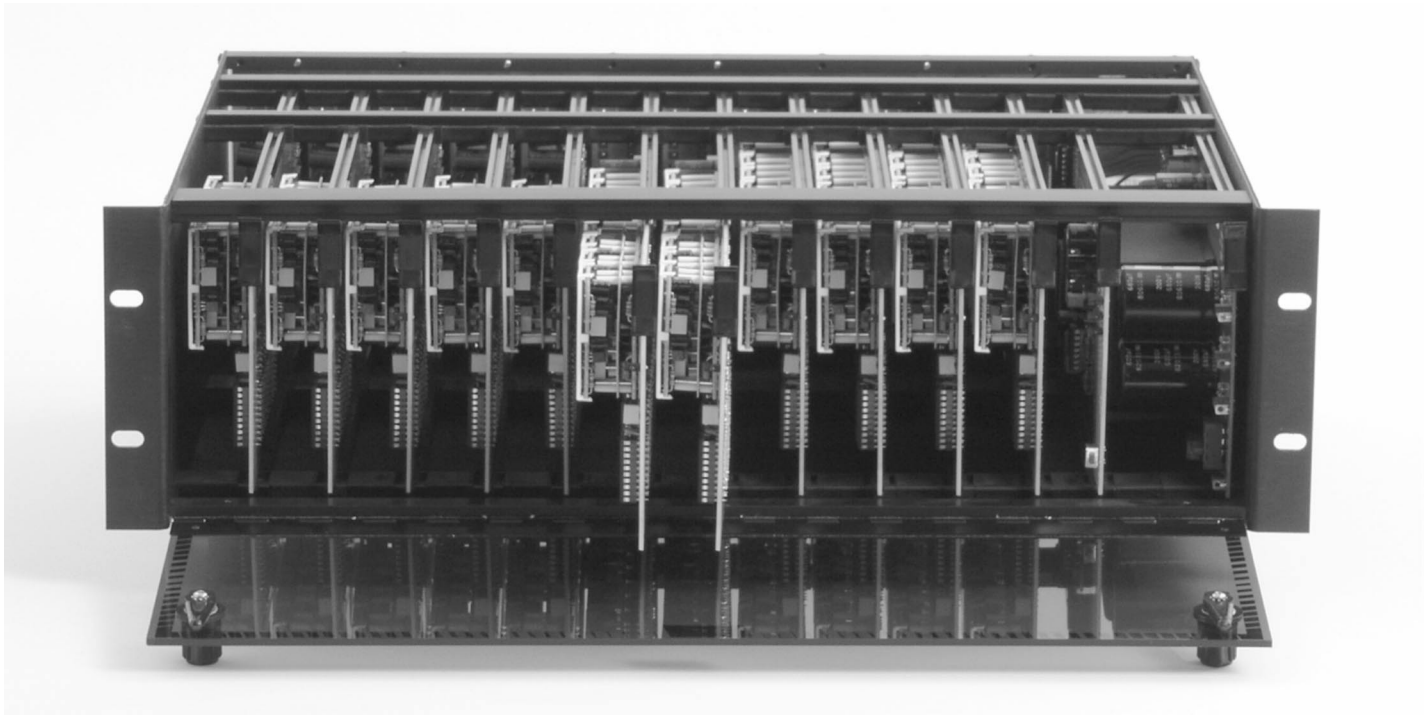
IED®
Innovative Electronic Designs

Model 540 Ambient Analysis System

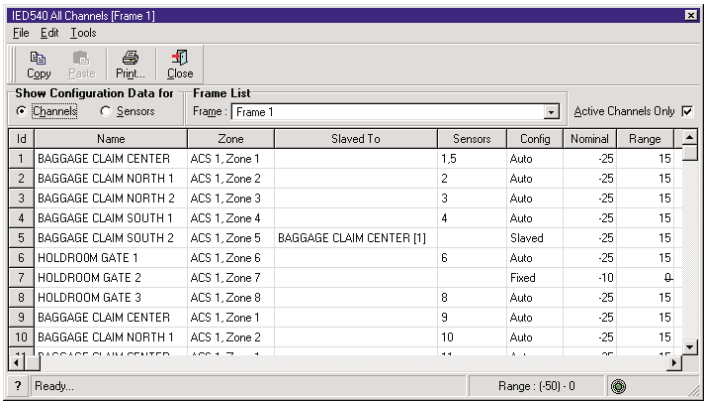


INTRODUCTION

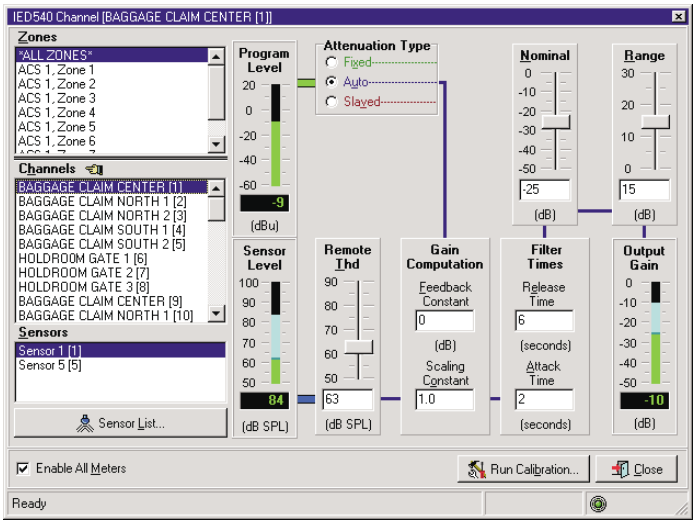
The Model 540 Ambient Analysis System is a versatile, flexible system which controls sound system channel levels in response to ambient or background noise levels. All parameters governing the manner in which the system responds to noise and adjusts the program signal can be individually set for each channel. The Model 625 software package is provided to set up the system, observe and tailor its operation, permanently save the setup parameters, and produce a printed record of them.

FEATURES AND OPTIONS

- 3 Modes of operation
  - Automatic: Changes attenuation in response to sensor signal
  - Controlled: Follows attenuation changes of another channel
  - Fixed Attenuation
- Each channel can be set to any mode
- One channel can be controlled by multiple sensors
- One sensor may control multiple channels
- Minimum and maximum attenuation limits can be individually set for each channel
- Attack and Release time can be individually set for each channel from 1 second to 7.16 hours
- Scaling Constant can be individually set for each channel
- Remote Threshold (noise level at which signal level begins to increase) can be individually set for each channel
- Automatic calibration of Feedback Constant can be individually set for each channel
- Controlled Channel attenuation can be offset from controlling channel attenuation
- Separate, fixed settings for Emergency announcements
- Accurate, dual, real time monitoring on computer screen—bar graph and digital displays of:
  - Channel Input Level in dBu
  - Remote Sensor Level, SPL in dB
  - Channel Attenuation in dB
- All settings saved in non-volatile (permanent) memory
- Password protection for security
- Printer output for hard copy record of all settings and operating parameters.
- Up to 44 channels can be housed in 5.25” of standard 19” rack space
- 3 types of 4 channel attenuator cards
- 3 sensor mounting configurations cover most applications
- Easy to retrofit into existing applications



The EDIT ALL CHANNELS screen, above, displays the settings for all channels. Setup information from one channel can be easily copied to other channels. The currently selected channel can be displayed in more detail in the Edit Channel screen (right). Values with strike through pertain to fixed channels and cannot be edited.



The EDIT CHANNEL screen, above, allows detailed setup and calibration of a single channel

SYSTEM DESCRIPTION

IED's more than 20 years in the computer controlled sound reinforcement business has led to the development of a new ambient analysis system using microprocessor technology. In the past, systems were plagued by problems of runaway gain, slow response time, noisy operation and many other problems. IED has hurdled all of these obstacles.

One of the unique features of the Model 540 is its ability to differentiate between ambient noise and the actual program material. In the past, systems could not make this distinction. The result was overcompensation, and consequent runaway gain. IED has developed a microprocessor based system and software which removes the contribution of the program signal from the sensed signal to determine the true level of the ambient noise. The microprocessor then directs the associated digital attenuator(s) corresponding to the appropriate program channel(s) to increase or decrease level accordingly. The period of time over which levels can be adjusted is established in the software in the range from 1 second to over 7 hours. For example, a stadium may use a very fast attack time (1 sec.) to keep the program audio above the crowd noise at all times, with fast dynamic adjustments. An amusement park may use a slow attack time (1 hour) to increase the program audio slowly as the park's attendance gradually increases throughout the day.

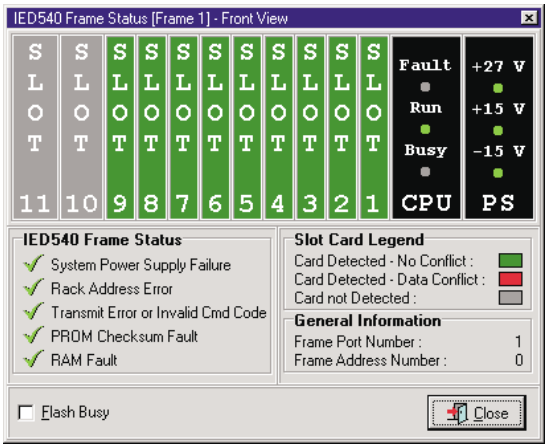
This is a "real-time" system which is always analyzing the ambient noise parameters regardless of program material. Audio channels are adjusted dynamically during pages and program presentation - in real time. In an airport, for example, as passengers flow into the baggage claim area, the program audio level increases dynamically during a long page. This sets the IED 540 Ambient Analysis System apart from other systems which "sample and set" during periods of no program, then "hold" that level until the next "off" period.

The unique Calibrate Channel screen displays realtime levels of key parameters, allowing the installer to accurately fine-tune the system and verify its proper operation. The computer is required only for setup and monitoring. Once this procedure is completed and the setup parameters are saved in non-volatile memory in the 540, the computer can be removed. The Model 540 will then operate without the use of a computer.

The new Model 540 Ambient Analysis system has the ability to control one channel or a group of channels in real-time response to the ambient noise. The heart of the system is the microprocessor which controls up to 44 channels at one time. Together with its associated software it provides precise control of the program level in response to inputs from remote sensors.

REMOTE SENSORS

IED's 540S ambient noise sensor units (called Remote Sensors) have mounting options for deep two gang electrical boxes or speaker back boxes and grills. One sensor can control from one to forty-four attenuators simultaneously, or a group of sensors can be averaged to control one attenuator. A Remote Sensor consists of an omnidirectional condenser microphone, a preamplifier, and an analog signal converter. They can be located up to 5000 feet from the mainframe. Connections between the sensors and the mainframe are made using standard audio shielded twisted pair cable.



The VIEW STATUS screen (left) indicates the presence or absence of cards and the occurrence and location of any faults.

MAINFRAME AND PROCESSING CARDS

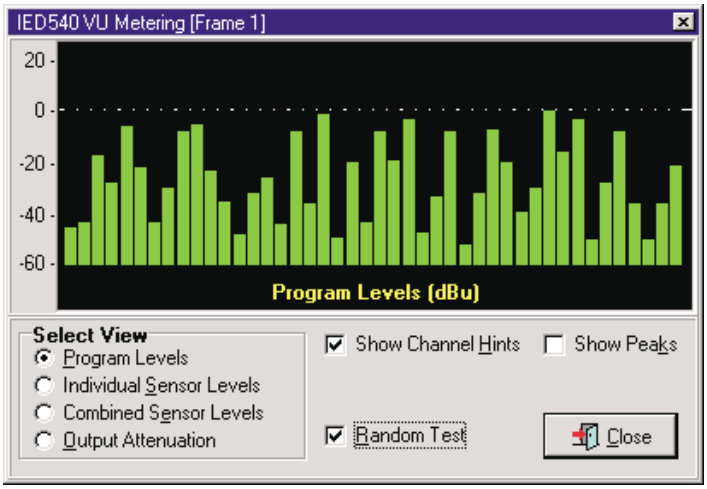
Modular construction is an important feature of the Model 540 Ambient Analysis System. Similar to other IED products, the 540 System is built with a mainframe (540M), a power supply card (540 PS), a plug-in microprocessor card (540CPU), and 1 to 11 audio processing cards (540I-AC, 540I, 540C).

Each 540M Mainframe System holds up to 11 four-channel audio processing cards, providing 44 channels of ambient analysis processing in one 5.25" mainframe. If more than 44 channels are required, simply add additional mainframe systems.

There are three types of audio processing cards: 540I-AC, 540I, and 540C:

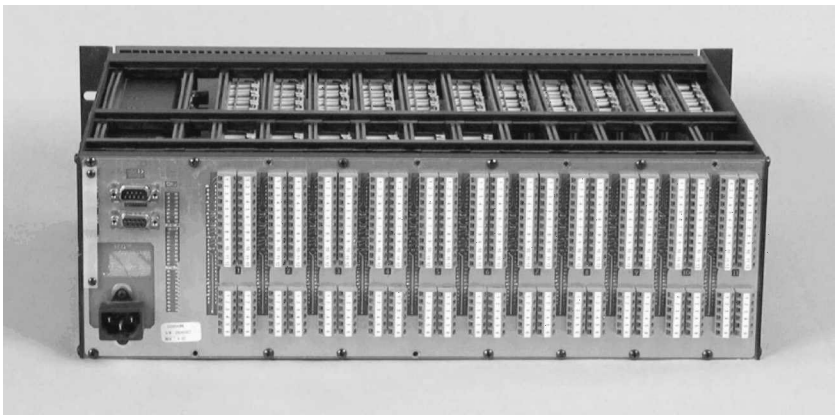
The 540I-AC card, the most commonly used card, provides four channels of program audio input/output, four channels of remote sensor interface, and four channels of level detector/comparator. This card has full functionality and can interface any program audio channel(s) with any 540S remote sensor channel(s) in the mainframe.

The 540I card provides only the four channels of program audio input/output. This card is only used when its program audio channels are being controlled by 540S remote sensors linked to other 540I-AC cards, or when its program audio channels are set to fixed attenuation.

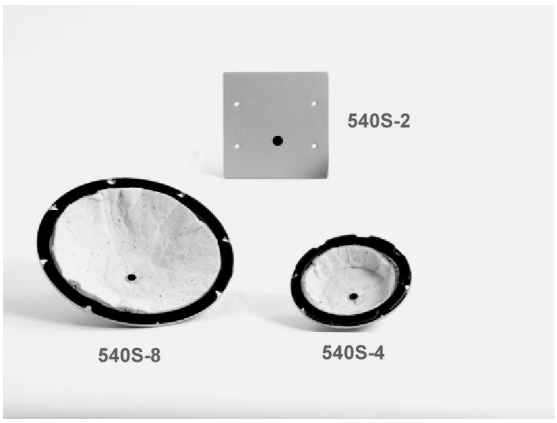


The METERS screen is a dynamic display of the level of every active channel as well as the maximum value reached.

The 540C card provides only the four channels of remote sensor interface. This card is only used to provide the interface to additional 540S remote sensors which combine to control program audio channels on other 540I-AC cards.



540M Mainframe - Rear View



540 Sensors

TYPICAL APPLICATIONS FOR NEW INSTALLATIONS OR RETROFIT

- Airports
- Racetracks
- Train Stations
- Hotel Ballrooms
- Convention Centers
- Sports Arenas
- Exhibit Halls
- Shopping Malls
- Theme Parks
- Industrial Plants
- Theaters
- Prisons

SPECIFICATIONS

SOFTWARE SPECIFICATIONS

Fixed Mode Channel Attenuation Range	0-50 dB
Fixed Mode Channel Attenuation increments	1 dB
Emergency Mode Channel Attenuation Range	0-50 dB
Emergency Mode Channel Increment	1 dB
Channel Input Level Display (dBu) Digital	–60 to +20 dBu
Remote Sensor Display (SPL) Digital	50 to 100 dB
Channel Attenuation Display (dB) Digital	0 to 50 dB
Scaling Constant	1.0 to 3.0
Increments	0.1
Feedback Constant	–85 to +85 dB
Increments	1 dB
Attenuation Offset	–30 to +20 dB
Increments	1 dB
Channels per rack	44, Max
Racks per system	1 to 4096 (Theoretical)
Address range	0-255
Port Range	0-15
Attack Time	1 to 25800 seconds (7.16 Hours)
Release Time	1 to 25800 seconds (7.16 Hours)
Attack Window	0-127 dB
Release Limit	0-127 dB

PRINTOUT DATA

Rack Information

Release Limit	Port
Rack Number	Address
Attack Window	

Channel Information

Channel Number	Nominal Attenuation
Controlling Sensor	Attenuation Ranges
Number	Remote Threshold
Normal Mode Attenuation	Feedback Constant
Emergency Mode	Attack Time
Attenuation	Release Time
Configuration	Scaling Constant

ELECTRICAL SPECIFICATIONS (at +24 dBu, 50 Ω source)

Frequency response, 20 Hz -20 kHz	+0,–.3 dB
Harmonic distortion, 20 Hz -20 kHz	<.01 %
Signal-to-noise ratio, 20 Hz to 20 kHz	>113 dB
Attenuation	16 bit linear D/A
Input configuration	Balanced
Input impedance	200 kΩ
Output configuration	Balanced and floating
Output impedance	<0.25 Ω
DC operating voltages (supplied by 540PS)	+30 V, +15 V, –15 V

POWER REQUIREMENTS

540M with 540PS and 540CPU	12 W, Max
540I	7W, Max
540IAC	10W, Max
540S	0.2W, Max
AC Line	120 VAC ±10%

NUMBER OF INPUTS/OUTPUTS

	540IAC	540C	540I
Inputs	4	—	4
Outputs	4	—	4
Channel level detectors	4	—	—
Remote Sensor inputs	4	4	4

INDICATORS, CONTROLS, AND FUSES (540PS)

+27 V indicator	Green LED
+15 V indicator	Green LED
–15 V indicator	Green LED
Power on/off	Slide switch
+27 V fuse	8AG 1 A
+15 V fuse	3AG 3 A
–15 V fuse	3AG 3 A
AC Line	3AG 3 A

CONNECTORS

Audio inputs and outputs	Lugless, compression-type screw terminals
Computer (RS232 loop through)	9-pin sub D (1 male, 1 female)
Power cord	Belden 17250 or equivalent

MECHANICAL SPECIFICATIONS

Size (540M Mainframe)	
Height	5 1/4”
Depth	15 1/4” (overall)
Width	19” (including flange)
Weight	
540M Mainframe	7.3 lb
540I Attenuator Card	1.4 lb
540I-AC Attenuator Card	1.8 lb
540CPU Central Processor Card	0.9 lb
540PS Power Supply	1.5 lb
540M Mainframe card slots	
540CPU Central Processor Card	1
540PS Power Supply Card	1
540I-AC or 540I Attenuator Cards	11

SENSORS

540S	Remote Sensor
540S-2	Remote Sensor on two gang Stainless steel plate
540S-4	Remote Sensor on 4” speaker basket
540S-8	Remote Sensor on 8” speaker basket

Innovative Electronic Designs, Inc. • 9701 Taylorsville Road • Louisville, Kentucky 40299 • USA
Phone: (502) 267-7436 • Fax: (502) 267-9070 • Internet: http://www.iedaudio.com

BR540-0102