



Overview

ECS is hardware controlled by software. RaneWare® is the software, and the family of products that the software controls. RW 232™ describes the protocol and the DB-9 hardware used to communicate between units.

The ECB 62 Base is controlled through the RW 232 serial bus. This interface operates on any RS-232 serial port, allowing control system communication with up to 16 RW 232 products at a time, each with a unique address. The ECM 82 Mixers are controlled through the Base using a proprietary Expansion Interface cable. Rane RW 232 products can be controlled from remote locations with the optional **RPD 1 Programming & Diagnostics Unit** (see the RPD 1 data sheet).

ECS RaneWare Manual

This manual contains information on RaneWare software installation and ECS controls, device control language, system setup, applications and operation.

All software controls are printed here in sans-serif type to help distinguish between hardware and software.

ECS consists of software-driven hardware. Consult the **ECS Hardware Manual** for the ECB 62 Base and ECM 82 Mixer installation options, audio and data connections, control and indicator descriptions, and audio specifications.

This manual first begins with RaneWare installation, then describes all software controls, and those particular to ECS. Applications & Using Presets describes example systems that may be used as a starting point for your own customized application. A Checklist and Site Survey addresses questions that may arise during installation or operation. After the system is connected and installed in place, the Alignment Procedure may begin. For those using control systems such as AMX or Crestron, the Device Control Language is provided.

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ECS is covered by US Patent 5,848,146

RaneWare is a registered trademark of Rane Corporation

Windows is a registered trademark of Microsoft Corporation

INSTALLING RANEWARE

For programming and setup of all of Rane's RW 232 products, Rane supplies a Windows® compatible software called RaneWare. This software is an easy-to-use graphical user interface and allows all Rane's RW 232 type products to be controlled in real time from the same executable.

System Requirements

- RaneWare works under Microsoft Windows® on a PC or laptop with an unused serial port.
- RW 232 needs a DB-9 cable less than 50' long, connecting from the serial port of a computer to the RW 232 CONTROL INPUT port. This cable is wired straight through, *not null modem*. No interface boxes are required; just a cable and the computer. See the **ECS Hardware Manual**.
- RaneWare can be fully demonstrated and operated without any unit attached (called 'offline').
- A RaneWare CD-ROM comes with each unit. RaneWare is a single program with different windows capable of controlling not only the ECS units, but also the RPE 228d Equalizer, and the RPM 26v or RPM 26i Multifunction Processor, the RPD 1 Programming and Diagnostics Unit and the Via 10 Ethernet Bridge. New products and revisions will be added in the future. Software updates can be obtained at Rane's web site, www.rane.com.

Software Installation

If you have the RaneWare CD-ROM, insert it in your drive. The autorun should bring up a prompt asking to install RaneWare. If it does not, go to the Windows Start menu, select Run... > Browse... and navigate to your CD-ROM drive. Select the SETUP.EXE file and click OK. This starts installation.

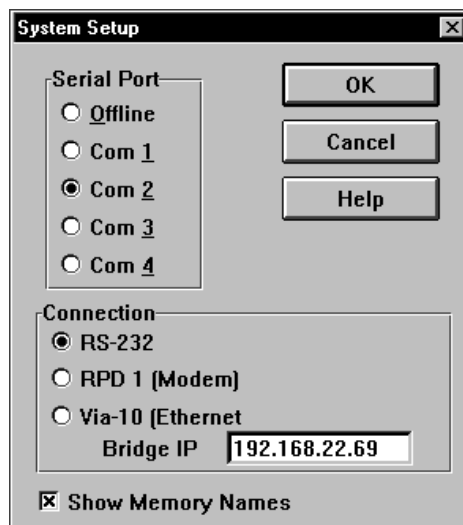
If you downloaded RaneWare from the web, locate the RW2**.EXE file you downloaded and run it. Installation proceeds.

Starting RaneWare

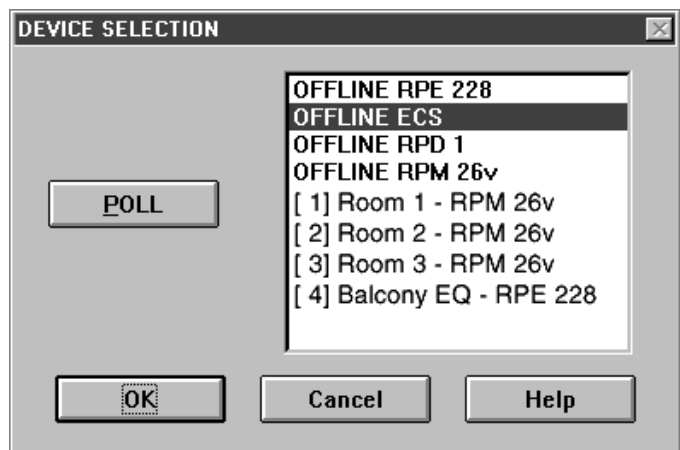
Once RaneWare is installed, a RaneWare program group is created. When the software is first installed, Rane's Software License Agreement is displayed. Then, the Help screen appears. Here, any questions may be answered. Subsequent activations do not bring up the License Agreement or the Help screen unless they are asked for. Close the Help file, and welcome to RaneWare!

If any question arises about a particular control on any software screen, position the pointer over the control and press F1 on your keyboard for Help.

The System Setup screen asks to which Com port RW 232 is attached. If you don't have a unit connected, you can still use RaneWare Offline. Click OK, then Polling begins the first time the program is run. This process checks for units connected to the serial port. Polling may also be invoked by selecting Device > Select > Poll. If a Device is found, you are in control! (If a device is hooked up and it is not found, read the Troubleshooting section of the Help file.) RaneWare polls addresses 1 thru 250. If the connected products are found, you may click the stop button at any time to end polling.



System Setup



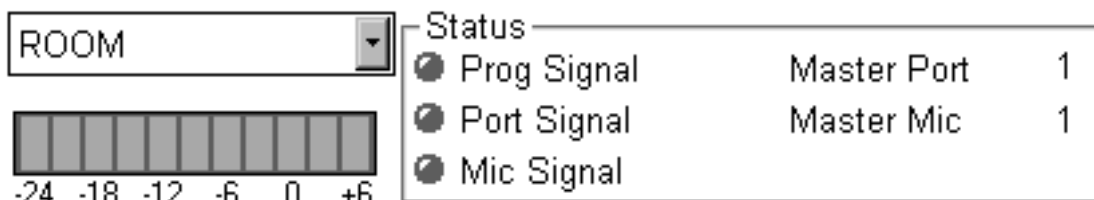
Device Selection Menu

ECS RANWARE

There are 4 sections to the ECS controlling software:

- Status (top screen section)
- Port (1st tab)
- Mixer (2nd tab)
- System (3rd tab)

When the mouse pointer is on any of the tabs, the current settings for that page can be copied and pasted to any other page by clicking the right mouse button.



Metering and Status

Metering

Both front panel and RaneWare Meters show the selected Port level. Always adjust the Inputs for a 0 dB peak reading. Output levels are shown in dBu. Always remember, 0 dBu = 0.775 Vrms.

In RaneWare, the Level Meter pull-down selects Port Inputs 1 through 6 or Port Outputs 1 or 3 for the Meter display. In the Port tab, double-clicking one of the Port Input selectors changes the Meter to this Port.

The example above shows ROOM (Port 1 Input). The displayed name can be changed so the Input or Output displayed on the Meter matches the device used on the given Input or Output. Use the Name button on the Port tab to change it.

The front panel PORT STEP button can also change the LEVEL meter on the ECB 62. Pressing this for 1 second causes the MASTER PORT STATUS LEDs to flash the currently monitored Input or Output of the LEVEL Meter. If this button is pressed and held for 5 seconds, the monitored Port can be changed by pressing the button in 1 second steps. The MASTER PORT STATUS LEDs will step through the Inputs for Port 1 to Port 6, then Outputs Port 1 and Port 3 and then back to Port 1's Input.

Status Indicators

The top center of the ECS software screen (and the ECB 62 front panel) contains the following Status indicators – all of which can be obtained via RS-232 based room control devices. (In the ECB 62 Device Control Language of the RaneWare Operators Manual-29 refer to the RW 232 Command Get OPSTAT.)

The three Signal indicators – Program, Port and Mic – are used within ECS to identify the current audio state of the system, i.e., where audio is present or absent. The patented performance advantages and much of ECS's automatic functionality is derived from the system being aware of the unit's current status.

Program Signal indicator (PGS LED on the ECB 62)

The Program indicator lights whenever audio is detected at the Port 1 (Program) Output, thus indicating that audio should be heard in the room. (If P3 Prog Contribute on the System tab is checked, both Port 1 and Port 3 Outputs are used to “sense” Program audio.)

Port Signal indicator (PTS LED on the ECB 62)

The Port indicator lights whenever audio is detected at any Port Input whose Signal Mode is set to Automatic. This includes mixer audio entering Port 1.

Mic Signal indicator (MCS LED on the ECB 62)

This lights whenever audio is detected at any Active Mic whose Mic Mode is set to Automatic.

Advanced auto power down example: Use the room controller to monitor the Port and Mic Signal status. When either is present, reset the power down timer that eventually shuts down the system thus saving the projector bulb, the associated power bill and actually save money!

Master Port

Identifies the current Master Port, which is the Port that most recently detected audio. Use Master Port Delay on the System tab for multipoint video applications.

Master Mic

Identifies the current Master Mic, which is the Mic that most recently detected audio. A Master Mic is a status signal generated when audio is detected at a Mic Input for a period of time longer than the Master Mic Delay timer setting. If an Input is assigned as Last On, and audio is detected for a period longer than the Master Mic Delay timer, that Input becomes the Master and remains on until a new Input takes over. The old Master Mic then releases and returns to its set Gate Depth. Use Master Mic Delay on the System tab for video-follows-audio applications.

Port

The Port tab allows configuration of the six individual ECB 62 Ports. Status signals of a Port have no effect on Port audio—this feature only affects the Master status of a Port.

Port Name

This button opens a dialog box permitting the Port Input and Output names to be changed so they match the devices actually hooked to the Ports. For example, **ROOM** can be changed to the local site's name. Also, the Device Name can be changed. The Device Name is useful in larger facilities or campuses with multiple ECS installs. For example, use the building's name as the Device Name.

Port Input selectors

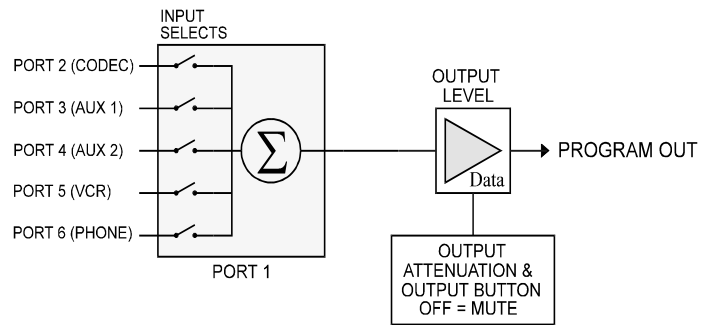
The box with the dark blue over-score indicates the Port whose Input settings are visible or editable. Each Port has independent Threshold Level, Input Attenuation, Signal Mode, etc. To view another Port's Input settings, click on any Port 1 through Port 6 to move the blue highlight and display or edit that Port's settings.

Double clicking on any Port Input selector changes the Level Meter to this Port.

The Port On buttons toggle between On (button down and indicator lit) and off/muted (button up and indicator gray).

The indicator above the On button means the following:

- Gray* = Port Input Off (muted, as in unheard)
- Green* = Port Input On
- Yellow* = Master Port



Port Input Selection

Port Signal Mode

Each Port can be assigned an independent Signal Mode which does not affect the audio. The Port Signal Mode is only used for control and system status information.

In multipoint videoconferencing, to perform video-follows-audio, the room controller can query the ECB 62 for the current Master Port. The Master Port parameter is used to switch to the proper video feed (Port) for display. Using Automatic Signal Mode for the Ports fed from the video codecs allows any one of the Ports to become the Master Port. In this application, a CD player connected to a Port would not be considered a video source. Therefore, setting the CD player Port's Signal Mode to Off allows the CD player to be excluded from Master Port consideration.

Automatic: Audio on the Port must exceed the Port's Threshold Level to trigger the Port Signal indicator on. Also, the Port will be able to become the Master Port for video-follows-audio applications.

On: the Port turns on the Port Signal indicator and the Port is forced to become the Master Port.

Port		Mixer				System		
ROOM	Port Inputs	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	
Name	Signal Mode	On	On	On	On	On	On	
<input checked="" type="radio"/> Limiter <input type="radio"/> Auto-Level <input type="radio"/> Off	<input checked="" type="radio"/> Automatic <input type="radio"/> On <input type="radio"/> Off	Threshold Level		-20 dB				
		Input Attenuation		4.0dB				
ROOM	CODEC	AUX1	AUX2	VCR	PHONE	Port Outputs		
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Program	6.0dB	<input type="radio"/>
<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> CODEC	10.0dB	<input type="radio"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> AUX1	6.0dB	<input type="radio"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> AUX2	0.0dB	<input type="radio"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> VCR	10.0dB	<input type="radio"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> PHONE	10.0dB	<input type="radio"/>

Mixer

Mixer

This selects one of six ECM 82 Mixers.

Output button

This toggles the ECM 82's Mix Out between *on* (green indicator, depressed button, audio unmuted) or *off* (gray indicator, raised button, audio muted). This is useful to temporarily turn off all of the Mics on a certain Mixer(s). Note that the Acoustic Echo Canceller still adapts when the Mix Out is muted with the Output button. Thus, use the Output button rather than the individual Active buttons to mute all Mics on a Mixer so the Echo Canceller continues to adapt.

Echo Canceller

Each Mixer may contain an optional Acoustic Echo Canceller. The Echo Canceller checkboxes control the operation of the Echo Canceller — only if it is installed.

When all three boxes are unchecked, the Echo Canceller operates at its normal 7 kHz bandwidth. If no Echo Canceller is installed, the Bypass check box must be checked. Also, check the Bypass box while adjusting the Mic gains during setup.

Bypass: Checking only this box bypasses the Echo Canceller. When there is no far-end, or in applications where no ECA 1 Echo Cancellers are used, check the Bypass box. Also, check this box when another device in the system is being used to perform the acoustic echo cancelling (i.e., Tandberg, Picturetel, VTEL...)

3 kHz: In this mode, the Echo Canceller operates at 3 kHz bandwidth. Always try leaving 3 kHz unchecked. If the far-end complains about echo, checking the 3 kHz box can help reduce the complaints.

Enhanced: This increases the bandwidth to 20 kHz by bypassing the Echo Canceller when the far-end is not talking. This is useful for music applications when a high fidelity in the far-end is required when the far-end is not talking.

Suppression

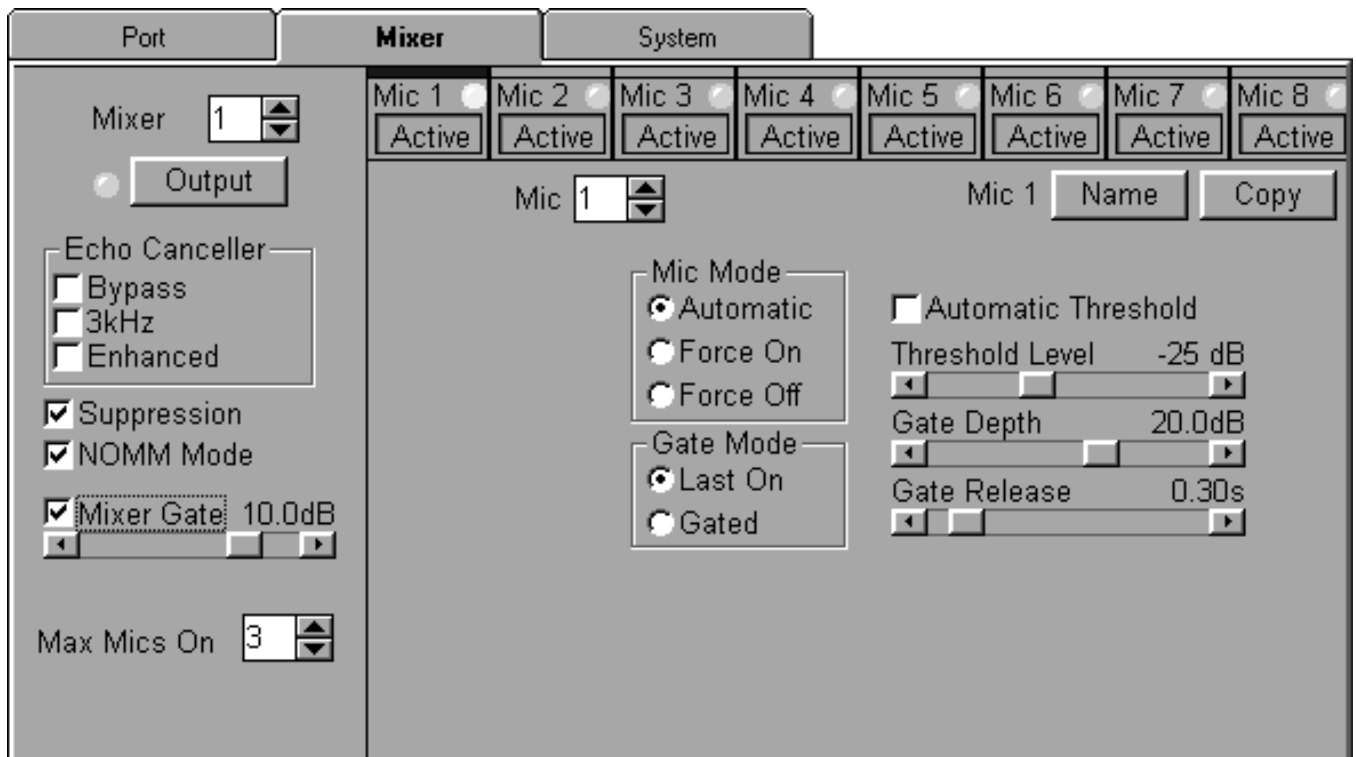
When a new Mic gates on, the Echo Canceller must re-adapt. This is the time when acoustic echo is most likely to occur, since the Echo Canceller must re-learn the acoustics of the room. Suppression can be used to avoid the echo that may occur when new Mics gate on. Suppression is only added for a few seconds after a new Mic gates on. In this sense, ECS Mixer Suppression can be thought of as “one-time” suppression.

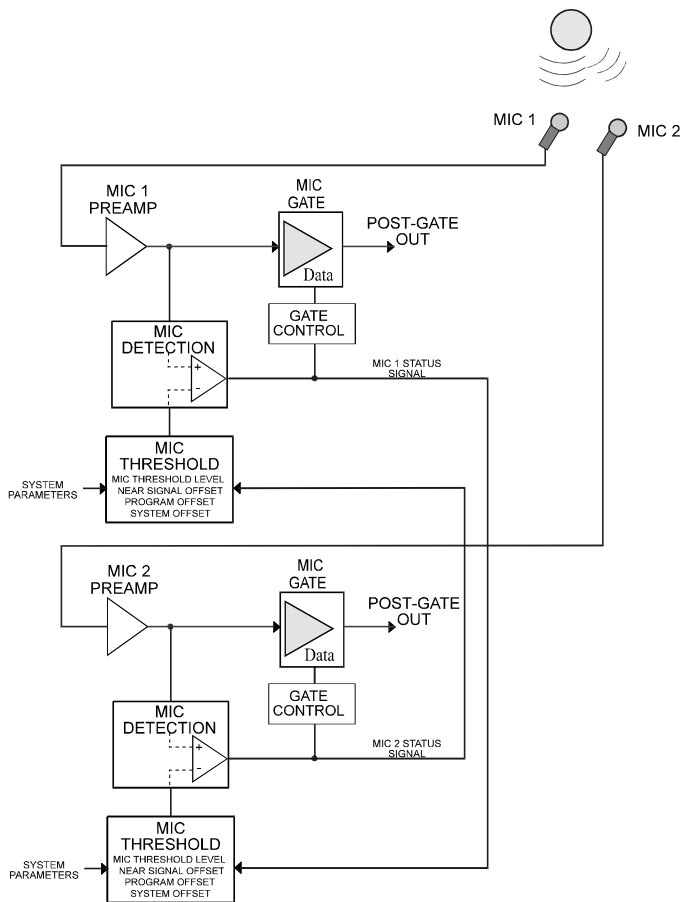
When checked, 12 dB of Suppression (attenuation) is added to the Mix Out – but only when a new Mic gates on.

Typical default value: When using the ECA 1 Acoustic Echo Canceller inside an ECM 82 Mixer, always check the Suppression box. When no, or an external acoustic echo canceller is used, leave this box unchecked.

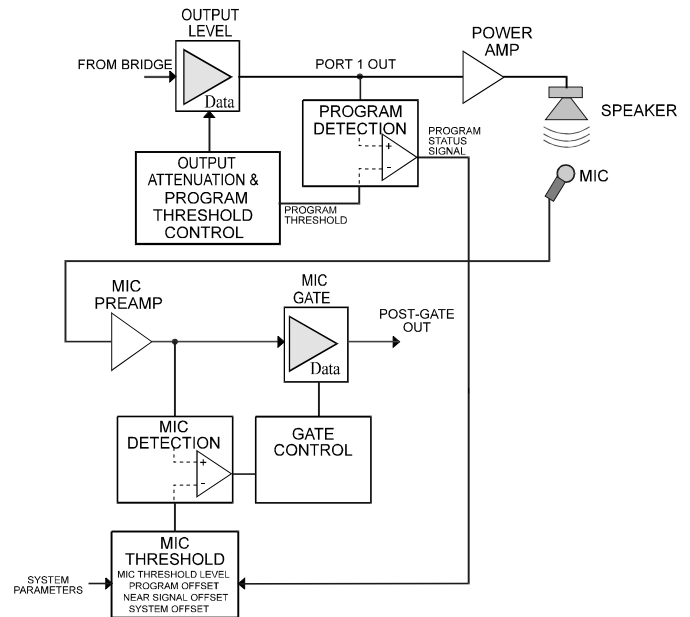
NOMM Mode

NOMM stands for Number of Open Mics (and Mixers). Most automatic mic mixers have a NOM operation mode. By keeping track of the Number of Open Mics, automatic mic mixers can automatically adjust the gains of the open mics to





Near Signal Offset signal flow



Program Signal Offset signal flow

Noise Gate activation and level

This feature is useful in multipoint conferencing when you want the near end's Mic audio (room noise) to be reduced at the far-end(s). The checkbox enables this feature.

When checked, the Noise Gate Level attenuates Port 1's Input when the Mic Status indicator is *off* (i.e., no audio detected at any Mics). This is useful in noisy room situations.

Typical default value: Off (unchecked)

Master Port Delay

This adjustable timer controls the speed at which a Port becomes the new Master Port.

The Master Port indicates which of the ECB 62 Input Ports most recently detected audio. This is useful in multipoint videoconferencing when you need to know which one of multiple locations is talking.

Query the ECB 62 for the Master Port OPSTAT parameter to decide which video feed to switch to. (A preposition is the wrong thing to end a sentence with.)

Typical default value: 0.35 seconds or more.

Master Mic Delay

This adjustable timer controls the speed at which a Mic becomes the new Master Mic.

The Master Mic indicates which Last On Mic most recently detected audio — thus indicating “who” is talking.

There are two reasons this *Smart Last On™* Master Mic idea is patented by Rane:

#1. Unlike most auto mic mixers, Smart Last On uses the Master Mic Delay to avoid the problem of the current talker's Mic Gating Off when others answer or interrupt.

For example, if the chairman is talking and someone else sneezes, Smart Last On allows the sneeze to be heard, but the chairman's Mic will not Gate Off. The chairman's Mic will remain the Last On Mic. Other mic mixer's “last on” may gate the chairman's Mic off (particularly if the chairman pauses) and the sneeze Mic will become the Last On Mic. This is bad because the chairman must re-gate his Mic on. All the while, the acoustic echo canceller has been trying to re-adapt to the quickly changing Mic gates. Also, the camera may be switching between the sneezer and the chairman.

Smart Last On avoids this problem by forcing the sneezer to exceed the (adjustable) Master Mic Delay time. Only then will the chairman's Mic Gate Off due to the sneezer's Mic becoming the Master Mic. Gesundheit!

#2. (Cool stuff.) Master Mic is also extremely useful in video-follows-audio applications when you need to move the camera position to follow “who” is talking. The Master Mic Delay timer can be adjusted to times beyond the time required

APPLICATIONS & USING PRESETS

Like all RaneWare products, ECS has a working Memory and 16 stored Memories. Working Memory is the operational Memory. An actual change to a level is made in working Memory. If a Memory is recalled, it is placed in working Memory. Any changes to working Memory will not affect the Memory it was recalled from. One of the great features of ECS is its ability to recall a partial Memory using a Room Controller. ECS Memories are divided into five sections:

1. Program device (All Memory)
2. Program Port settings only
3. Program Mic settings only
4. Program Mixer settings only
5. Program Mics and Mixer settings only

Partial Memories are recalled using the CHNUM setting in the RW 232 command **Program Channel from Memory**. This feature is beneficial for initializing the system and setting presets for different room configurations without affecting audio levels. *Partial Memories cannot be called from RaneWare.*

For more system examples, download "Distance Learning Applications for ECS" at <http://www.rane.com/ecs.htm>.

System 1: Typical Video Conference Room

As an introduction, this example illustrates a relatively simple ECS with 8 mics, a video codec, digital hybrid, 2 VCRs, and a telephone connection. The system block diagram is shown on the following page, the point-to-point wiring of the audio and control signals is following, and the corresponding RaneWare computer screens are on the following page.

Rane Equipment

- 1 ECB 62 Base
- 1 ECM 82A Mixer with Echo Canceller
- 1 ECM 64 Conference System with DH 1 Digital Hybrid
- 1 RPD 1 Programmable Diagnostics Unit

RaneWare Setup

RaneWare allows saving all system parameters to disk. The file for this system is called AP1V2.ECS, located on the RaneWare disk. This file has six preset Memories. The RaneWare windows on page RW Manual-16 show the saved parameters for Memory 1.

Perform the Mic and Port setups on page RW Manual-21 before loading this file. After loading, select Preset Memory 1 to set the system to its default. Loading this file into the ECB 62 is all that is required for most systems.

To load a system file: Select Device > Restore Memories from File. Loading files into the ECB 62 causes it to restart.

To load Port names: Select Device > Restore Names from File.

In this application, Port Inputs must be Selected by the Room Controller. The laptop is only used for the initial system setup. It is then removed and the Room Controller assumes operation. The Device Control Language for programming the Controller begins on page RW Manual-24.

Preset Memories

Memory 1 - Room Controller operational mode. In this mode all Port Outputs have their Input select checkboxes cleared and all Mic Inputs are Active and set to Automatic operation. This is performed by selecting the Port Memory settings from Preset Memory 1 at start-up, allowing the Room Controller to know the start-up condition of ECS.

Memory 2 - This connects the Conference Room (Port 1) to the ECM 64 (Port 6).

Memory 3 - This connects the Conference Room (Port 1) to the Codec (Port 2).

Memory 4 - This allows the VHS (Port 4 Input) to be heard at the program speakers (Port 1 Output).

Memory 5 - This bridges the Conference Room (Port 1), Codec (Port 2) and ECM 64 (Port 6) together.

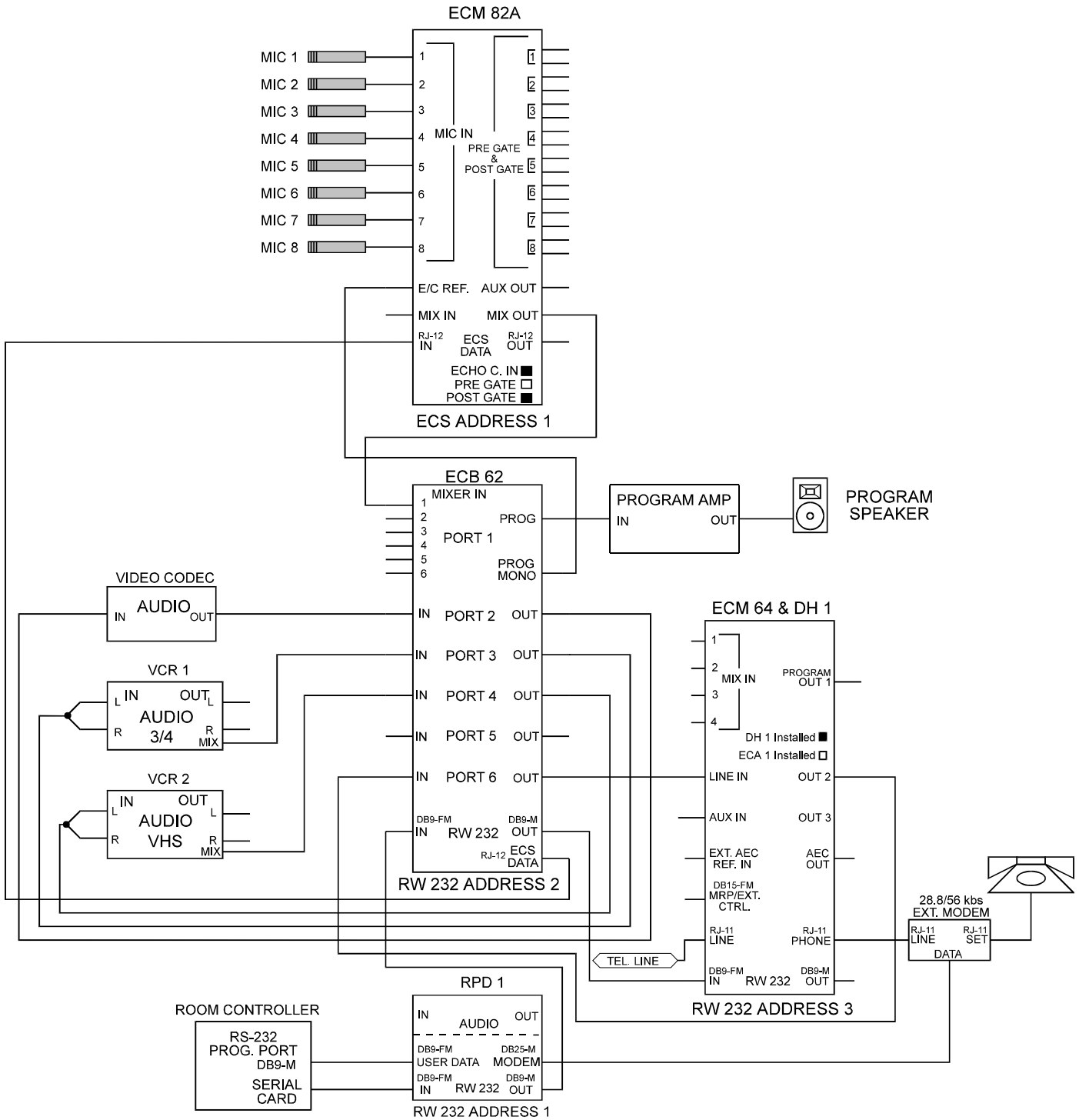
Memory 16 - Preconditions the Port Inputs and the Mic Inputs for alignment.

Room Controller

In the Start-Up of the Room Controller, Preset 1 must be recalled to set the system defaults. If the Input and Output Levels need to be restored to their defaults, send the Program Channel From Memory command with CHNUM set to 0.

If the Input and Output Levels are to be saved as they were last set, send the Program Channel From Memory command with CHNUM set to 1. If just the Mic settings need to be saved, send the same command with CHNUM set to 2.

Chairman control is performed setting the Near Signal Offset to 101 and forcing a Mic On. This prohibits other Mics from Gating On. See the ECB 62 Device Control Language on page RW Manual-24.



This block diagram illustrates the Applications - System 1 example on the preceding page.

Port **Mixer** **System**

ROOM
Name

Port Inputs
 Port 1 On
 Port 2 On
 Port 3 On
 Port 4 On
 Port 5 On
 Port 6 On

Signal Mode
 Automatic
 On
 Off

Threshold Level -20 dB

Input Attenuation 4.0dB

ROOM	CODEC	AUX1	AUX2	VCR	PHONE	Port Outputs	On
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Program 6.0dB <input type="text"/> <input type="text"/> <input type="text"/>	<input type="radio"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> CODEC 10.0dB <input type="text"/> <input type="text"/> <input type="text"/>	<input type="radio"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> AUX1 0.0dB <input type="text"/> <input type="text"/> <input type="text"/>	<input type="radio"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> AUX2 10.0dB <input type="text"/> <input type="text"/> <input type="text"/>	<input type="radio"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> VCR 0.0dB <input type="text"/> <input type="text"/> <input type="text"/>	<input checked="" type="radio"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> PHONE 10.0dB <input type="text"/> <input type="text"/> <input type="text"/>	<input type="radio"/>

Port **Mixer** **System**

Mixer 1

Output

Echo Canceller
 Bypass
 3kHz
 Enhanced

Suppression
 NOMM Mode

Mixer Gate 0.0dB

Max Mics On 3

Mic 1 Mic 1 Name Copy

Mic Mode
 Automatic
 Force On
 Force Off

Gate Mode
 Last On
 Gated

Automatic Threshold
 Threshold Level -25 dB

Gate Depth 20.0dB

Gate Release 0.30s

RaneWare Folders for
API.ECS Memory 2

Port **Mixer** **System**

Power-Up Noise

P3 Prog Contribute

Link Prog Signal

Port 1
 Suppression 0.0dB

Noise Gate 0.0dB

Master Port Delay 0.35s

Master Mic Delay 0.35s

Port Sig Release 0.35s

Mic Sig Release 0.35s

Prog Sig Release 0.35s

Near Sig Offset 18dB

Prog Sig Offset 18dB

System Offset 0dB

Prog Sig Thresh -20 dB

System 3: Distance Learning

This illustrates a distance learning application using broadband video that requires reinforcement of the teachers' Mics. There are 2 teacher Mics and 10 student Mics, a connection to 3 other classrooms using a video demodulator, a VCR and a video modulator. The mics are evenly spread between the ECM 82s. To reinforce the teachers, the Post Gate Outputs from these mics on the ECM 82A #1 are tied together and connected to the Input of Port 6 on the ECB 62. Port 6 is then routed to the Output of Port 3. Since the Output impedance of the Post and Pre Gates are 300 ohms, tying these Outputs together creates a passive mixer. Do not use P3 Prog Contribute when local Mics are routed to Port 3.

Rane Equipment

- 1 ECB 62 Base
- 2 ECM 82A Mixers with Echo Cancellers

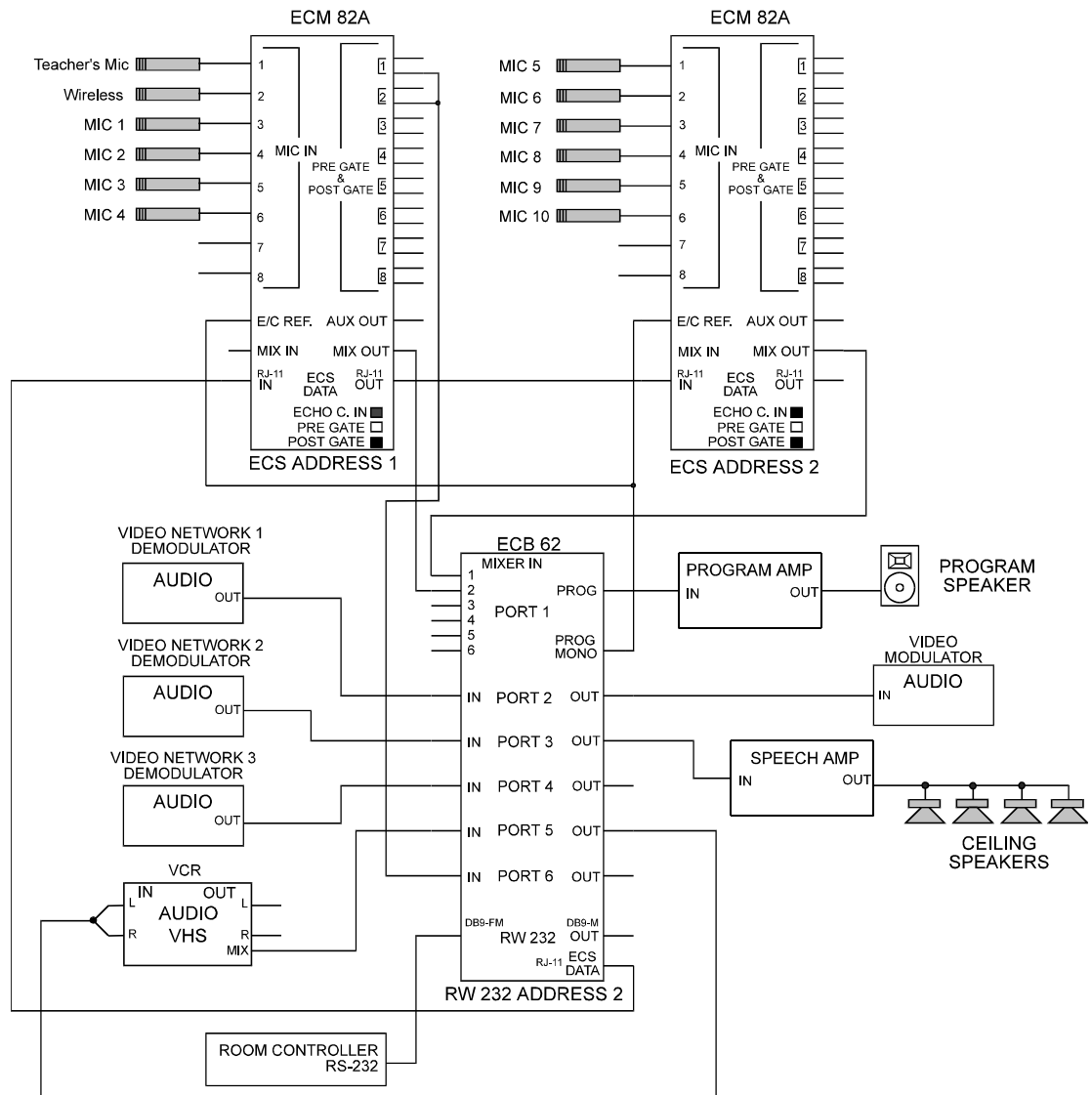
RaneWare Setup

The file for this application is called AP3V2.ECS, located on the RaneWare disk. This file has 8 preset operational Memories.

Memory 1 - Room

Controller operational mode. In this mode all Port Outputs have their Input select checkboxes cleared and all Mic Inputs are Active and set to Automatic operation. This is performed by selecting the Port Memory settings from Preset Memory 1 at start-up, allowing the Room Controller to know the start-up condition of ECS.

- Memory 2 - Selecting this Preset Memory connects the Conference Room (Port 1) to Video Network 1 (Port 2).
- Memory 3 - Selecting this Preset Memory connects the Conference Room (Port 1) to Video Network 2 (Port 3).
- Memory 4 - Selecting this Preset Memory connects the Conference Room (Port 1) to Video Network 3 (Port 4).
- Memory 5 - Selecting this Preset Memory allows the VHS (Port 5 Input) to be heard at the Program Speakers (Port 1 Output).
- Memory 6 - Selecting this Preset Memory connects the Conference Room (Port 1) to (Port 6).
- Memory 7 - Selecting this Preset Memory bridges the Conference Room (Port 1), Video Network 1 (Port 2), Video Network 2 (Port 3) and Video Network 3 (Port 4) together.
- Memory 16 - Preconditions the Port Inputs and the Mic Inputs for alignment.



System 4: Large Conference Center

The following illustrates a very large ECS with 40 Mics, stereo program speakers, 2 zone mono ceiling speakers with sound reinforcement, a video CODEC, a digital hybrid, an audio matrix switcher, a fiber video network, and a telephone connection.

Sound reinforcement utilizes a 6-channel stereo Mixer to create 2 speech zones. The Zone 1 Mics are only played in Zone 2 by panning Ports 1 thru 3 to the left. The Zone 2 Mics are only played in Zone 1 by panning Ports 4 and 5 to the right. Mics 1-24 are placed in Zone 1, and Mics 25-40 are placed in Zone 2. To play program audio from the Base in both Zones, Port 6 is panned to center.

The audio feed from the remote location is not sent to the program loudspeakers, instead Port 3 is used for the teleconferencing speakers and the Echo Canceller reference for the ECM 82As.

- Memory 2 - Selecting this Preset Memory connects the Conference Room (Port 1) to the Codec (Port 2).
- Memory 3 - Selecting this Preset Memory connects the Conference Room (Port 1) to the Matrix (Port 4).
- Memory 4 - Selecting this Preset Memory connects the Conference Room (Port 1) to Video Network (Port 5).
- Memory 5 - Selecting this Preset Memory connects the Conference Room (Port 1) to the Digital Hybrid (Port 6).
- Memory 6 - Selecting this Preset Memory bridges the Conference Room (Port 1), Video Codec (Port 2), Video Network 1 (Port 5) and Digital Hybrid (Port 6) together.
- Memory 16 - Preconditions the Port Inputs and the Mic Inputs for alignment.

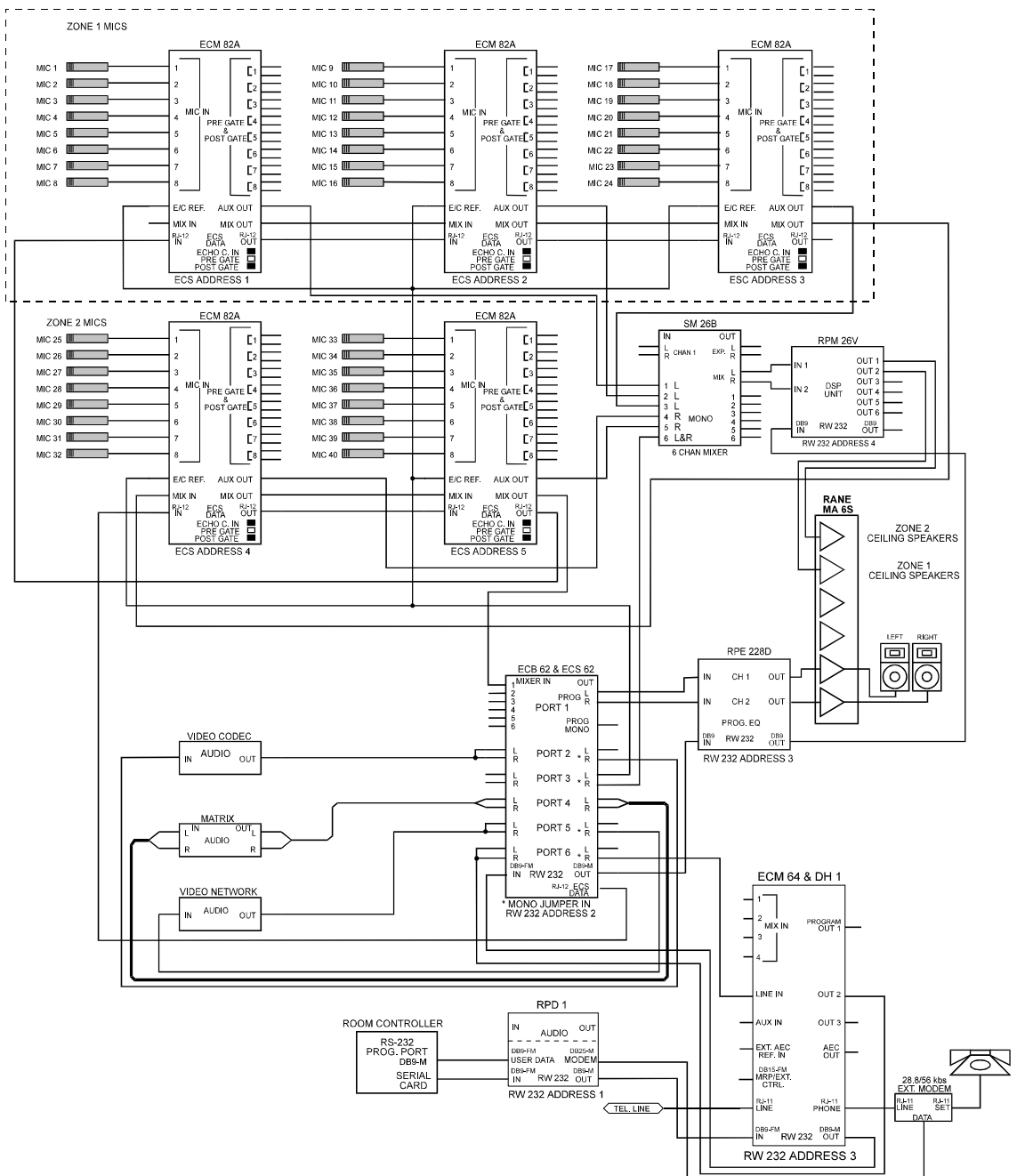
Rane Equipment:

- 1 ECB 62 Base
- 5 ECM 82A Mixers with Echo Cancellers
- 1 ECM 64 with DH 1 Digital Hybrid
- 2 RPE 228d Programmable Equalizers
- 1 SM 26B Line Mixer
- 1 MA 6S Multichannel Power Amp
- 1 RPD 1 Programmable Diagnostics Unit

RaneWare Setup

The file for this application is called AP4V2.ECS, located on the RaneWare disc. This file has 7 preset Memories.

Memory 1 - Room Controller operational mode. In this mode all Port Outputs have their Input select checkboxes cleared and all Mic Inputs are Active and set to Automatic operation. This is performed by selecting the Port Memory settings from Preset Memory 1 at start-up, allowing the Room Controller to know the start-up condition of ECS.



SITE SURVEY

For ECS to operate properly the following must be closely observed:

Ambient Noise Level - Air conditioning equipment (listen for rushing air from registers and rattling air ducts), fan noise from computer equipment, outside traffic noise, etc. Ideal is NC 25 - NC 30 (35 to 40 dBA).

Room Absorption and reverberation time - For any conference system to operate properly the sound reflections must be held to a minimum. Sound reflections can be held down by using sound absorption materials and non-parallel walls or geometrical diffusers. Ceilings should have an NRC (Noise Reduction Coefficient) rating of .75 to .80 and walls should have an NRC rating of .80 to .90.

Microphone and Loudspeaker placement - It is best to use same boundary type microphones with each microphone 4 to 6 feet apart. These microphones can reject about 12 dB of audio from the rear. Never aim microphones directly at any loudspeaker. It is best to place loudspeakers at the front center of the room. Ceiling speakers can be used if they are placed 1 foot or greater to the rear of the microphone or 4 feet or greater in front of the microphone. Angled ceiling speakers work best.

Make certain that there is adequate rack space, ventilation and power outlets for the ECS equipment. Keep all ECS equipment in the same rack.

Loudspeaker Audio Processing - If any processing is done, limiters, delays, etc., between the ECB 62 Base and the loudspeaker power amp, the ECM 82's Echo Canceller Reference Input must be wired to the input of the power amp and not the Mono Output of the ECB 62 Base.

Ceiling Microphones - These microphones are typically not recommended. If you must, the ceiling must be less than 10 feet in height and the room must have very low noise with a high NRC rating. Never place a microphone within 4 feet of an air conditioning register. Using techniques such as out of phase microphones or speakers may work in some rooms, but at best you will only gain about 6 dB of speaker to microphone cancellation.

MultiZone Echo Cancelling (MZECTM) - By dividing the room into zones with each zone consisting of 1 ECM 82A mixer, improved echo canceller performance can be achieved. Full duplex operation can be improved by reducing the number of microphones on each mixer to 4.

Telephone Line - The telephone line should be a direct line to the telephone company's central office. This line should not be shared by others, this may cause ground loops.

SYSTEM CHECKLIST

1. Know the microphone type, placement and number of microphones.
2. Determine the operation (Last On or Gated) of each Mic in RaneWare. Use Last On Mics for the main participants. Use Gated Mics for gallery areas.
3. How good are the room acoustics? Poor room acoustics may require turning on Port 1 Suppression and/or the Noise Gate. The Near Signal Offset and Mic Signal Offset may need increasing.
4. Are Echo Cancellers required and how many?
5. Is telephone add-on required?
6. Is stereo audio required, and if so, which devices need mono audio?
7. How many audio sources are there (Codecs, VCR, etc.), and what are their audio output and input levels?
8. Is remote diagnostics required? (See the Rane RPD 1).
9. Is the system used for Multipoint? During a multipoint conference, enable the Noise Gate with at least 6 dB of depth.
10. Are there any non-linear devices (limiter, compressors, etc.) between the ECB 62 Output and the amplifiers? If so, use the output of these devices for the Echo Canceller Reference to the ECM 82s.

ECS ALIGNMENT PROCEDURE

QUICK OVERVIEW

- Set up the ECM 82 Mic levels.
- Set up the Input levels to the ECB 62.
- Set the Mic operation for each Input on the ECM 82.
- Set the Program Signal Threshold and Offset on the ECB 62, utilized to keep Mics from Gating On with audio at the loudspeakers. Typical settings with Port 1's Output set to 0 dB - Program Signal Threshold 20 dB, Program Signal Offset 20 dB.
- Set the Near Signal Offset, utilized to keep other Mics from Gating On when the Mic signal is Active. Typical setting 20 dB.
- Enabling Port 1 Suppression removes residual echo. Typical level is 6 to 12 dB. The higher the level the more the system sounds like half duplex.
- The Port 1 Noise Gate is normally not needed, but may be during multipoint operation. Typical level is 6 to 12 dB.
- On the Mixer tab, the Echo Canceller has three operation selections - Bypass, 3kHz and Enhanced. Typical setting is all unchecked. Bypass is used during Mic setup and when an Echo Canceller is not installed. Only use 3kHz in very large room applications. The Enhanced mode improves the audio quality by bypassing the Echo Canceller when audio is detected at a Mic.
- Enabling Mixer Suppression adds suppression to the Mixer Output when there is a new gated Mic. Suppression is only performed once to remove residual echo caused by the re-adaptation of the Echo Canceller. This setting is typically *on*.
- Mixer Gate is only used when there are 2 or more ECM 82As. Do not use this function when connecting another mixer to the ECM 82's Expansion Input. Typical settings are checked and 12 dB.

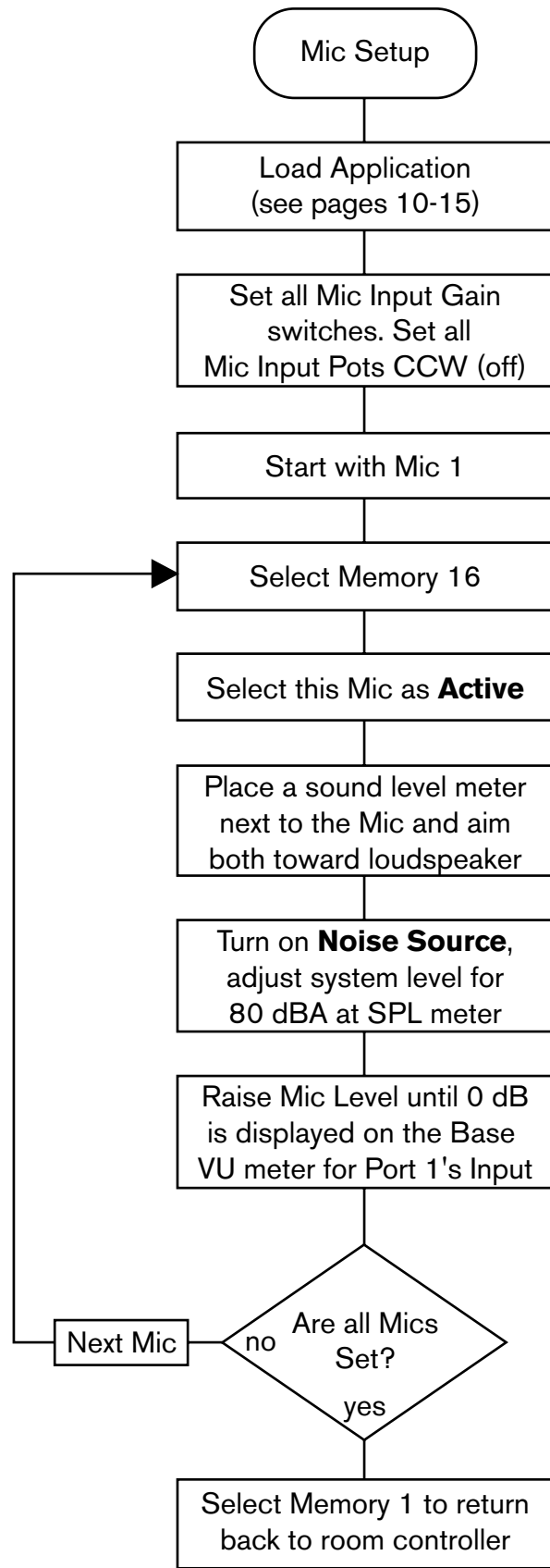
Use the following procedures to adjust the Mic and Port Inputs. Before proceeding, know the audio input and output levels required for the interfacing equipment. Also know the input and output type: balanced using transformer, active, or unbalanced. See RaneNote 110, "Sound System Interconnection" for cabling recommendations.

MIC SETUP (see flow chart)

The ECM 82 is shipped with its INPUT GAINS set to -10 dBu. When Gain is set to 40 dB, the Mic Inputs are calibrated to an Audio Technica AT 961R. (See **Phantom Power** in the **ECS Hardware Manual** if required.)

To set Mic levels a Sound Level Meter is required, such as a Radio Shack 33-2050.

- Remove the security cover.
- Start with Mic 1 and only work with one Mic at a time.
- Select the proper Input GAIN setting for the Mic (typically 40 dB)
- Set all Mic Input LEVELS to 0 (fully CCW).
- If front speakers are used, point the Mic towards them.
- Place the Sound Level Meter next to the Mic and set it as follows: Range to 80 dB, A-Weighting, Slow Response.



Mic Setup Flow Chart

MIC THRESHOLD LEVEL SETUP

Once all Mics have been adjusted, the Threshold Levels need to be set. In most applications operating the Mics with a Threshold Level of -25 dB is sufficient.

Automatic Threshold uses the first Mic of each Mixer to adapt to the background noise level. Set Mic Threshold Levels so they don't generate a Mic Signal from ambient room noise.

PORT INPUT SETUP

Ports 2 thru 6 have both a hardware PAD switch and a software programmable attenuation control.

The ECB 62 is shipped with its Inputs set to -10 dBu, PADs set to 0 dB and Input Attenuation controls set to 4 dB.

To properly adjust the Port's Input level:

1. Remove security cover.
2. Turn all Port Inputs Off.
3. Select the Port under test from the Port tab.
4. Port Input: On
5. Auto Level: unchecked
6. Input Attenuation: 4 dB typical
7. If a Port is connected to a Codec, the Codec may have an output test tone. Some Codecs have audio output transformers with output levels of -10 dBm. Since the Port Inputs have a 10k ohm impedance, a gain of approximately 6 dB is realized. (An optional 604 ohm or 620 ohm ¼ watt resistor may be placed across the + and - Inputs for termination. See ECS Hardware, page HWManual-17.) If the stereo module is installed, only use one termination resistor when connecting the Left and Right Inputs together.
8. If the stereo module is installed, only the Right (bottom) can be monitored for level.
9. Play an audio source connected to the Port under test. If the Input Clip OL LED lights, turn on the 10 dB PAD. Then adjust the Input Attenuation control for 0 dB peaks.
10. After completing, Auto-Level may be selected.
11. Replace the security cover.

PORT OUTPUT SETUP

The ECB 62 output level is nominally 0 dBu when an input is at 0 dB VU.

To properly adjust the Port's Output Attenuation level:

1. If the device is a Codec or the device requires a nominal level of -10 dBm, set Output Attenuation to -10 dB.
2. Set the Port 1 Output or Program to -6 dB, then adjust the room's power amplifier for an adequate listening level.

PROGRAM SIGNAL SETUP

Turn down the power amp, turn on the Noise Source, and set Port 1's Output (Program) to 0 dB. For most applications adjust the power amp for an 80 dB SPL. This level is determined by the mic/speaker placement and room acoustics.

All Mics and Mixers must be set up first. All Mics that are to operate using speech detection must be set with Active On and Signal Mode Automatic.

To set the Program Signal Offset and Program Signal Threshold:

1. Link Prog Signal: unchecked
2. Set Prog Sig Offset: 0 dB
3. Set Port 1 Output Attenuation: 0 dB
4. Play any source audio or use the Noise Source.
5. Set the Prog Sig Threshold to -20 dB. The Program Signal status LED lights.
6. Increase the Prog Sig Offset until the Mic Signal status LED extinguishes, typically between 12 and 20 dB.
7. Link Prog Signal: checked
8. Set Port 1 Output Attenuation: -6 dB
9. Program audio should not cause the Mic Signal status indicator to light. If it does, re-check Port Input Setup and repeat.

The greater the Program Signal Offset, the more difficult it is to Gate a Mic On when there is program audio.

When the Link Program Signal is On, the Program Signal Offset and the Program Signal Threshold will change in proportion to the Port 1 Output Attenuation.

TROUBLESHOOTING

POWER LED is Off:

Check POWER connection on rear panel, and that the remote supply is connected to a live AC source.

No communication between the unit and computer:

Set the DEVICE ADDRESS to a unique small number, and try polling for units in RaneWare (under Device > Poll). The unit should be found quickly.

Check that the COM port selected in RaneWare (under Setup > System Setup) is the one on your computer that is connected to the unit. Also check that the cable is a standard RS-232 cable (not a null modem type). If an adaptor is used, *it must not be null modem*. The cable must be connected to the RW 232 INPUT jack on the rear of the unit. See the **ECS Hardware Manual**.

Audio hum or noise:

Try Muting the unit. If this helps significantly, the problem may be with the Input connection, or the equipment driving the Input. If Muting has little effect, the problem is likely either the Output connection, or equipment driven by the Output.

ECS is intended to connect to equipment with balanced audio I/O and chassis-grounded shield/common. This kind of audio interconnection should maximize audio quality. Connecting equipment with signal grounded shields or unbalanced connections may result in hum or noise due to induced currents in the signal path. It may be possible to reduce or eliminate these problems, although some experimentation may be required:

Try disconnecting the audio cable shields at one end, particularly between chassis grounded and signal grounded equipment.

Try combinations of lifting grounds on units supplied with ground lift switches (or links).

Verify that all chassis are tied to a good earth ground.

Some units with outboard power supplies do *not* ground the chassis through the line cord. Make sure these units are grounded by tying the Chassis Ground Point to a known earth ground. A star washer guarantees proper contact.

For more information on balanced interconnection and grounding, please refer to RaneNote 110, “*Sound System Interconnection*” or Journal of the AES Vol. 43 No. 6 (June 1995).

ECB 62 DEVICE CONTROL LANGUAGE

Data Structures:

Abbreviations used:

\$:	signifies hexadecimal number
ADDR:	device address
CHNUM:	channel number code
COMSTAT:	communications status code
DCL:	device control language
DT:	Device-type code (predefined)
ID:	Manufacturer's ID code (predefined)
MEMNUM:	memory number code
OPSTAT:	operational status code
SPL:	stored parameter list (product dependent)

Definition:

Two's Complement: The result obtained when all the data bits are inverted and 1 is added to the result. Used to represent negative numbers. The Two's Complement of 3 (i.e. 0000 0011) is equal to 1111 1101 or \$FD. This represents '3'.

ECB 62 Stored Parameter List (SPL):

Index	Hex	Name / System Parameters:	Encoding Method	
0	\$00	VU Meter Port Display	0-7 (byte)	0 = Port 1 IN, 1 = Port 2 IN, 2 = Port 3 IN, 3 = Port 4 IN, 4 = Port 5 IN, 5 = Port 6 IN, 6 = Port 1 OUT, 7 = Port 3 OUT
1	\$01	Master Port Delay (×100 ms)	1-60 (byte)	1 = 100 ms, 2 = 200 ms, etc.
2	\$02	Master Mic Delay (×100 ms)	1-60 (byte)	1 = 100 ms, 2 = 200 ms, etc.
3	\$03	Port Sig Release (×100 ms)	1-60 (byte)	1 = 100 ms, 2 = 200 ms, etc.
4	\$04	Mic Sig Release (×100 ms)	1-60 (byte)	1 = 100 ms, 2 = 200 ms, etc.
5	\$05	Near Sig Offset (dB) & Chairman control = Chair Off = Chair On	0-40 (byte) 100 101	0 = 0 dB, 1 = 1 dB, etc.
6	\$06	Prog Sig Release (×100 ms)	1-60 (byte)	1 = 100 ms, 2 = 200 ms, etc.
7	\$07	Prog Sig Offset (dB)	0-40 (byte)	0 = 0 dB, 1 = 1 dB, etc.
8	\$08	Prog Sig Threshold (dB)	-45 +9	-45 = -45 dB, ... , 9 = 9 dB**
9	\$09	System Offset (dB)	0-10 (byte)	0 = 0 dB, 1 = 1 dB, etc.
10	\$0A	Noise Source On (ON/OFF)	1/0 (byte)	1 = ON, 0 = OFF
11	\$0B	Noise Source Power-Up (ON/OFF)	1/0 (byte)	1 = ON, 0 = OFF
12	\$0C	Suppression (ON/OFF)	1/0 (byte)	1 = ON, 0 = OFF
13	\$0D	Suppression Level (dB)	0-100 (byte)	See dB Conversion Chart
14	\$0E	Noise Gate (ON/OFF)	1/0 (byte)	1 = ON, 0 = OFF
15	\$0F	Noise Gate Depth (dB)	0-100 (byte)	See dB Conversion Chart
16	\$10	P3 Prog Contribute (ON/OFF)	1/0 (byte)	1 = ON, 0 = OFF
17	\$11	Link Prog Sig (ON/OFF)	1/0 (byte)	1 = ON, 0 = OFF
Port 1 Parameters:				
18	\$12	Input (ON/OFF)*	1/0 (byte)	1 = ON, 0 = OFF
19	\$13	Input Select*	0-31 (byte)	Bitwise where Bit 0 = IN 1, Bit 1 = IN 2, Bit 2 = IN 3, Bit 3 = IN 4, Bit 4 = IN 5
20	\$14	Input Attenuation (dB)	0-100 (byte)	See dB Conversion Chart
21	\$15	Auto-Level*	0/1/2 (byte)	0 = OFF, 1 = Auto-Level, 2 = Limiter
22	\$16	Sig Mode (AUTO/ON/OFF)*	2/1/0 (byte)	2 = AUTO, 1 = ON, 0 = OFF
23	\$17	Threshold Level (dB)	-45 +9	-45 = -45 dB, ... , 9 = 9 dB**
24	\$18	Output (ON/OFF)*	1/0 (byte)	1 = ON, 0 = OFF
25	\$19	Output Attenuation (dB)	0-100 (byte)	See dB Conversion Chart
26 33	\$1A-21	Port 2 Parameters	Same as Port 1 Parameters	
34 41	\$22-29	Port 3 Parameters	Same as Port 1 Parameters	
42 49	\$2A-31	Port 4 Parameters	Same as Port 1 Parameters	
50 57	\$34-39	Port 5 Parameters	Same as Port 1 Parameters except for Input Select	
51	\$33	Port 5 Input Select*	0-63 (byte)	Bitwise where Bit 0 = IN 1, Bit 1 = IN 2, Bit 2 = IN 3, Bit 3 = IN 4, Bit 4 = IN 5, Bit 5 = IN 6 (See Fig. 2, Hardware Manual)
58 65	\$3A-41	Port 6 Parameters	Same as Port 1 Parameters	

Index	Hex	Mixer 1 Parameters:			
66	\$42	Echo Canceller Bypass (ON/OFF)*	1/0	(byte)	1 = ON, 0 = OFF
67	\$43	Echo Canceller 3 kHz (ON/OFF)*	1/0	(byte)	1 = ON, 0 = OFF
68	\$44	Echo Canceller Enhanced (ON/OFF)*	1/0	(byte)	1 = ON, 0 = OFF
69	\$45	Mixer Gate (ON/OFF)*	1/0	(byte)	1 = ON, 0 = OFF
70	\$46	Mixer Gate Depth (dB)	0-100	(byte)	See dB Conversion Chart (next page)
71	\$47	NOMM Mode (ON/OFF)*	1/0	(byte)	1 = ON, 0 = OFF
72	\$48	Output (ON/OFF)*	1/0	(byte)	1 = ON, 0 = OFF
73	\$49	Max Mics On	1-8	(byte)	1 = 1 mic, 2 = 2 mics, etc.
74	\$4A	Suppression (ON/OFF)*	1/0	(byte)	1 = ON, 0 = OFF
75-83	\$4B-53	Mixer 2 Parameters	Same as Mixer 1 Parameters		
84-92	\$54-5C	Mixer 3 Parameters	Same as Mixer 1 Parameters		
93-101	\$5D-65	Mixer 4 Parameters	Same as Mixer 1 Parameters		
102-110	\$66-6E	Mixer 5 Parameters	Same as Mixer 1 Parameters		
111-119	\$6F-77	Mixer 6 Parameters	Same as Mixer 1 Parameters		

Mic 1 Parameters:

120	\$78	Active (ON/OFF) *	1/0	(byte)	1 = ON, 0 = OFF
121	\$79	Sig Mode (AUTO/ON/OFF)*	2/1/0	(byte)	2 = AUTO, 1 = ON, 0 = OFF
122	\$7A	Gate Mode (LAST ON/GATED)*	1/0	(byte)	1 = LAST ON, 0 = GATED
123	\$7B	Gate Depth (dB)	0-100	(byte)	
124	\$7C	Automatic Threshold (AUTO/MANUAL)*	1/0	(byte)	1 = AUTO, 0 = MANUAL
125	\$7D	Threshold Level (dB)	-45 +9		-45 = -45 dB, ... , 9 = 9 dB**
126	\$7E	Gate Release (×100 ms)	1-60	(byte)	1 = 100 ms, 2 = 200 ms, etc.
127-133		Mic 2 Parameters	Same as Mic 1 Parameters		
134-140		Mic 3 Parameters	Same as Mic 1 Parameters		
141-147		Mic 4 Parameters	Same as Mic 1 Parameters		
148-154		Mic 5 Parameters	Same as Mic 1 Parameters		
155-161		Mic 6 Parameters	Same as Mic 1 Parameters		
162-168		Mic 7 Parameters	Same as Mic 1 Parameters		
169-175		Mic 8 Parameters	Same as Mic 1 Parameters		
176-182		Mic 9 Parameters	Same as Mic 1 Parameters		
183-189		Mic 10 Parameters	Same as Mic 1 Parameters		
190-196		Mic 11 Parameters	Same as Mic 1 Parameters		
197-203		Mic 12 Parameters	Same as Mic 1 Parameters		
204-210		Mic 13 Parameters	Same as Mic 1 Parameters		
211-217		Mic 14 Parameters	Same as Mic 1 Parameters		
218-224		Mic 15 Parameters	Same as Mic 1 Parameters		
225-231		Mic 16 Parameters	Same as Mic 1 Parameters		
232-238		Mic 17 Parameters	Same as Mic 1 Parameters		
239-245		Mic 18 Parameters	Same as Mic 1 Parameters		
246-252		Mic 19 Parameters	Same as Mic 1 Parameters		
253-259		Mic 20 Parameters	Same as Mic 1 Parameters		
260-266		Mic 21 Parameters	Same as Mic 1 Parameters		
267-273		Mic 22 Parameters	Same as Mic 1 Parameters		
274-280		Mic 23 Parameters	Same as Mic 1 Parameters		
281-287		Mic 24 Parameters	Same as Mic 1 Parameters		
288-294		Mic 25 Parameters	Same as Mic 1 Parameters		
295-301		Mic 26 Parameters	Same as Mic 1 Parameters		
302-308		Mic 27 Parameters	Same as Mic 1 Parameters		
309-315		Mic 28 Parameters	Same as Mic 1 Parameters		
316-322		Mic 29 Parameters	Same as Mic 1 Parameters		
323-329		Mic 30 Parameters	Same as Mic 1 Parameters		
330-336		Mic 31 Parameters	Same as Mic 1 Parameters		
337-343		Mic 32 Parameters	Same as Mic 1 Parameters		
344-350		Mic 33 Parameters	Same as Mic 1 Parameters		
351-357		Mic 34 Parameters	Same as Mic 1 Parameters		
358-364		Mic 35 Parameters	Same as Mic 1 Parameters		
365-371		Mic 36 Parameters	Same as Mic 1 Parameters		

372-378	Mic 37 Parameters	Same as Mic 1 Parameters
379-385	Mic 38 Parameters	Same as Mic 1 Parameters
386-392	Mic 39 Parameters	Same as Mic 1 Parameters
393-399	Mic 40 Parameters	Same as Mic 1 Parameters
400-406	Mic 41 Parameters	Same as Mic 1 Parameters
407-413	Mic 42 Parameters	Same as Mic 1 Parameters
414-420	Mic 43 Parameters	Same as Mic 1 Parameters
421-427	Mic 44 Parameters	Same as Mic 1 Parameters
428-434	Mic 45 Parameters	Same as Mic 1 Parameters
435-441	Mic 46 Parameters	Same as Mic 1 Parameters
442-448	Mic 47 Parameters	Same as Mic 1 Parameters
449-455	Mic 48 Parameters	Same as Mic 1 Parameters

dB Conversion Chart for Attenuators

Transmitted Integer Value dB Attenuation

0.5 dB Steps						1 dB Steps						2 dB Steps		
Dec	Hex	dB	Dec	Hex	dB	Dec	Hex	dB	Dec	Hex	dB	Dec	Hex	dB
0	\$00	0.0	16	\$10	8.0	32	\$20	16.0	48	\$30	32.0	64	\$40	48.0
1	\$01	0.5	17	\$11	8.5	33	\$21	17.0	49	\$31	33.0	65	\$41	50.0
2	\$02	1.0	18	\$12	9.0	34	\$22	18.0	50	\$32	34.0	66	\$42	52.0
3	\$03	1.5	19	\$13	9.5	35	\$23	19.0	51	\$33	35.0	67	\$43	54.0
4	\$04	2.0	20	\$14	10.0	36	\$24	20.0	52	\$34	36.0	68	\$44	56.0
5	\$05	2.5	21	\$15	10.5	37	\$25	21.0	53	\$35	37.0	69	\$45	58.0
6	\$06	3.0	22	\$16	11.0	38	\$26	22.0	54	\$36	38.0	70	\$46	60.0
7	\$07	3.5	23	\$17	11.5	39	\$27	23.0	55	\$37	39.0	71	\$47	62.0
8	\$08	4.0	24	\$18	12.0	40	\$28	24.0	56	\$38	40.0	72	\$48	64.0
9	\$09	4.5	25	\$19	12.5	41	\$29	25.0	57	\$39	41.0	73	\$49	66.0
10	\$0A	5.0	26	\$1A	13.0	42	\$2A	26.0	58	\$3A	42.0	74	\$4A	68.0
11	\$0B	5.5	27	\$1B	13.5	43	\$2B	27.0	59	\$3B	43.0	75	\$4B	70.0
12	\$0C	6.0	28	\$1C	14.0	44	\$2C	28.0	60	\$3C	44.0	76	\$4C	72.0
13	\$0D	6.5	29	\$1D	14.5	45	\$2D	29.0	61	\$3D	45.0	77	\$4D	74.0
14	\$0E	7.0	30	\$1E	15.0	46	\$2E	30.0	62	\$3E	46.0	78	\$4E	76.0
15	\$0F	7.5	31	\$1F	15.5	47	\$2F	31.0	63	\$3F	47.0	79	\$4F	100
												100	\$64	100

ECB 62 Global Parameters

Type: Bytes: Description:

Unit name	16	ASCII string
Port names	48	ASCII string: 1 st 8 bytes=name of Port 1, 2 nd 8 bytes=name of Port 2,... , 6 th 8 bytes=name of Port 6
Mic names	384	ASCII string: 1 st 8 bytes=name of Mic 1, 2 nd 8 bytes=name of Mic 2,... , 48 th 8 bytes=name of Mic 48
Unit lock flag	1	1 if unit is locked (read-only)
Elapsed time	4	Time of use in seconds (read-only) (Note: This is unsigned long integer. If bit 31 is set, it means an error occurred, e.g. someone removed the EEPROM while the unit was powered and the time was restarted from that point.
Reserved	4	Normally set to 0,0,0,0 (factory use only)

Note: All ASCII strings are NULL terminated when they are less than the allocated string length. Otherwise, omit the NULL.

Device address (ADDR):

Valid address range is 1 through 250 (0, 251, 252, 253, 254, and 255 are reserved)

Device-type code (DT):

\$30 = ECB 6

Manufacturer's identification code (ID):

\$08 = Rane Corporation

Channel number codes (CHNUM):

Always set to \$00 except when the following DCL commands are issued: *Program channel from memory* (a.k.a. Program Device), *Mute channel* (a.k.a. Mute port), and *Unmute channel* (a.k.a. Unmute port).

Memory number codes (MEMNUM):

\$00 = *live* or working memory, \$01 = preset memory #1, \$02 = preset memory #2, ... , \$10 = preset memory #16 (ECB 62 has 16 preset memories)

Communications status codes (COMSTAT):

\$00 = no error
\$01 = invalid data
\$02 = invalid command code
\$03 = device locked
\$04 = device *not* locked
\$05 = channel(s) muted
\$06 = channel(s) *not* muted
\$07 = checksum error
\$08 = not connected

Operational status codes (OPSTAT):

\$00 = no error	\$05 = Mixer 5 memory error
\$01 = Mixer 1 memory error	\$06 = Mixer 6 memory error
\$02 = Mixer 2 memory error	\$07 = RW 232 receive error
\$03 = Mixer 3 memory error	\$08 = ECS Expansion port transmit overflow error
\$04 = Mixer 4 memory error	\$09 = RW 232 parity error

RW 232 Commands**Send data to channel (81 hex):**

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR) (See Note 9)
Get DT
Get ID
Transmit \$X1 \$X2 (where \$X1 X2 = number of data bytes to follow including checksum) (\$01 \$CD = *all* data)
Transmit \$81 (command code)
Transmit \$00 (CHNUM)
Transmit MEMNUM
Transmit 2 bytes; the starting SPL param byte index (See Note 5)
Transmit SPL
Transmit Checksum
Get COMSTAT

Program channel from memory (82 hex): (a.k.a. Program Device)

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)
Get DT
Get ID
Transmit \$00 \$04 (where \$00 04 = number of data bytes to follow including checksum)
Transmit \$82 (command code)
Transmit CHNUM (\$00 = program device, \$01 = program ports only, or \$02 = program mics only, \$03 = program mixer only, \$04 = program mics and mixers only) (See Note 4)
Transmit MEMNUM
Transmit Checksum
Get COMSTAT

Program all channels of all devices from memory (82 hex):

Transmit \$FB \$00 \$FB \$00
Transmit \$00 \$03 (where \$00 03 = number of data bytes to follow including checksum)
Transmit \$82 (command code)
Transmit MEMNUM
Transmit Checksum

Lock device (85 hex):

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)

Get DT

Get ID

Transmit \$00 \$02 (where \$00 02 = number of data bytes to follow including checksum)

Transmit \$85 (command code)

Transmit \$79 (checksum)

Get COMSTAT

Unlock device (86 hex):

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)

Get DT

Get ID

Transmit \$00 \$02 (where \$00 02 = number of data bytes to follow including checksum)

Transmit \$86 (command code)

Transmit \$78 (checksum)

Get COMSTAT

Mute port (87 hex): (a.k.a. Mute Port)

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)

Get DT

Get ID

Transmit \$00 \$03 (where \$00 03 = number of data bytes to follow including checksum)

Transmit \$87 (command code)

Transmit CHNUM = Port # (0=Port 1...5=Port 6)

Transmit Checksum

Get COMSTAT

Mute all channels of all devices (87 hex):

Transmit \$FB \$00 \$FB \$00

Transmit \$00 \$02 (where \$00 02 = number of data bytes to follow including checksum)

Transmit \$87 (command code)

Transmit \$77 (Checksum)

Unmute channel (88 hex): (a.k.a. Unmute Port)

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)

Get DT

Get ID

Transmit \$00 \$03 (where \$00 03 = number of data bytes to follow including checksum)

Transmit \$88 (command code)

Transmit CHNUM = Port # (0=Port 1...5=Port 6)

Transmit Checksum

Get COMSTAT

Unmute all channels of all devices (88 hex):

Transmit \$FB \$00 \$FB \$00

Transmit \$00 \$02 (where \$00 02 number of data bytes to follow including checksum)

Transmit \$88 (command code)

Transmit \$76 (Checksum)

Send globals (8C hex):

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)

Get DT

Get ID

Transmit \$01 \$CB (where \$01 CB = number of data bytes to follow including checksum)

Transmit \$8C (command code)

Transmit Global Parameters

Transmit Checksum

Get COMSTAT

SNPL Stored Name Parameter List (SNPL):

Index	Hex	Parameters	Encoding Method
00-08	\$00-\$08	Output Name 1	8 (char)
09-16	\$09-\$10	Output Name 2	8 (char)
17-24	\$11-\$18	Output Name 3	8 (char)
25-32	\$19-\$20	Output Name 4	8 (char)
32-40	\$21-\$28	Output Name 5	8 (char)
41-48	\$29-\$30	Output Name 6	8 (char)

Send Output names (\$8D)

Transmit ADDR header (\$FB xx \$FB xx, where xx = ADDR) (See Note 9)

Get DT

Get ID

Transmit \$X1 \$X2 (where \$X1 \$X2 = number of data bytes to follow including checksum) (\$00 \$33 = all data)

Transmit \$8D (command code)

Transmit the starting Name index (0 = Beginning of the first Name)

Transmit SNPL

Transmit Checksum

Get COMSTAT

Get OPSTAT (00 hex):

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)

Get DT

Get ID

Transmit \$00 \$02 (where \$00 02 = number of data bytes to follow including checksum)

Transmit \$00 (command code)

Transmit \$FE (Checksum)

Get STATUS (See Notes 6 and 7)

Get Checksum

Get COMSTAT

STATUS consists of 19 bytes returned in this order:

Byte	Parameter	Value
1	OPSTAT	See OPSTAT return values on Page 4
2	Preset Memory	1 16
3	Working/stored flag	1/0 (See Note 6)
4	Working/dirty flag	1/0 (See Note 7)
5	VU Display	0 7, 0 = Port 1 IN, 1 = Port 2 IN, 2 = Port 3 IN, 3 = Port 4 IN, 4 = Port 5 IN, 5 = Port 6 IN, 6 = Port 1 OUT, 7 = Port 3 OUT
6	VU Level (dB)	-45 +9, -45 = -45 dB, ... , 9 = 9 dB**
7	Master Port	0 5, 0 = Port 1, 1 = Port 2, 2 = Port 3, 3 = Port 4, 4 = Port 5, 5 = Port 6
8	Master Mic	0 47, 0 = Mic 1, 1 = Mic 2, etc.
9	Port Sig flag	1/0
10	Mic Sig flag	1/0
11	Prog Sig flag	1/0
12	Near Sig Offset (dB)	1 40 (See Note 8)
13	Prog Sig Threshold (dB)	-45 +9, -45 = -45 dB, ... , 9 = 9 dB**
14	Mix 1 Status	Bitwise where Bit 0 = Mic 1, Bit 1 = Mic 2, Bit 2 = Mic 3, ... , Bit 7 = Mic 8
15	Mix 2 Status	Bitwise where Bit 0 = Mic 1, Bit 1 = Mic 2, Bit 2 = Mic 3, ... , Bit 7 = Mic 8
16	Mix 3 Status	Bitwise where Bit 0 = Mic 1, Bit 1 = Mic 2, Bit 2 = Mic 3, ... , Bit 7 = Mic 8
17	Mix 4 Status	Bitwise where Bit 0 = Mic 1, Bit 1 = Mic 2, Bit 2 = Mic 3, ... , Bit 7 = Mic 8
18	Mix 5 Status	Bitwise where Bit 0 = Mic 1, Bit 1 = Mic 2, Bit 2 = Mic 3, ... , Bit 7 = Mic 8
19	Mix 6 Status	Bitwise where Bit 0 = Mic 1, Bit 1 = Mic 2, Bit 2 = Mic 3, ... , Bit 7 = Mic 8

Flash COM LEDs on all units (00 hex):

Transmit \$FB \$00 \$FB \$00

Transmit \$00 \$02 (where \$00 02 = number of data bytes to follow including checksum)

Transmit \$00 (command code)

Transmit \$FE (Checksum)

Get data from channel (01 hex):

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)
Get DT
Get ID
Transmit \$00 \$08 (where \$00 08 = number of data bytes to follow through start param)
Transmit \$01 (command code)
Transmit \$00
Transmit MEMNUM
Transmit 2 bytes; the starting SPL param byte index (See Note 5)
Transmit 2 bytes; the number of SPL parameter bytes (See Note 5)
Transmit Checksum (See Note 3)
Get SPL
Get Checksum (for SPL)
Get COMSTAT

Get device-type and manufacturer's identification codes (02 hex):

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)
Get DT
Get ID
Transmit \$00 \$02 (where \$00 02 = number of data bytes to follow including checksum)
Transmit \$02 (command code)
Transmit \$FC (Checksum)
Get COMSTAT

Get globals (03 hex):

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)
Get DT
Get ID
Transmit \$00 \$02 (where \$00 02 = number of data bytes to follow including checksum)
Transmit \$03 (command code)
Transmit \$FB \$FB (Checksum, See Note 1)
Get Global Parameters
Get Checksum (for Global Parameters)
Get COMSTAT

Get device serial/identification number (04 hex):

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)
Get DT
Get ID
Transmit \$00 \$02 (where \$00 02 = number of data bytes to follow including checksum)
Transmit \$04 (command code)
Transmit \$FA (Checksum)
Get 3-byte number, MSB first
Get Checksum (for serial ID)
Get COMSTAT

Get software revision (05 hex):

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)
Get DT
Get ID
Transmit \$00 \$02 (where \$00 02 = number of data bytes to follow including checksum)
Transmit \$05 (command code)
Transmit \$F9 (Checksum)
Get hardware revision
Get software revision ($\times 10$)
Get Checksum (for hardware and software revisions)
Get COMSTAT

Get Expansion Revisions (0A hex):

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)

Get DT

Get ID

Transmit \$00 \$02 (where \$00 02 = number of data bytes to follow including checksum)

Transmit \$0A (command code)

Transmit \$F4 (Checksum)

Get Expansion Revisions (7 bytes are returned. Byte 1 = software revision of ECB 62, byte 2 = software revision of 1st ECM 82, byte 3 = software revision of 2nd ECM 82, ... , byte 7 = software revision of 6th ECM 82. A zero in any byte 2 7 indicates that the corresponding ECM 82 is not connected.)

Get Checksum

Get COMSTAT

Get Output Names (\$0C)

Transmit ADDR header (\$FB xx \$FB xx, where xx = ADDR) (See Note 9)

Get DT

Get ID

Transmit \$00 \$04 (where \$00 \$04 = number of data bytes to follow through the start parameter)

Transmit \$07 (command code)

Transmit the Name Index (0 = Beginning of the first name)

Transmit the number of Name Indexes (\$30 = all names)

Transmit the checksum

Get SNPL

Get Checksum

Get COMSTAT

Reset Unit (91 hex):

Transmit ADDR header (\$FB xx FB xx, where xx = ADDR)

Get DT

Get ID

Transmit \$00 \$03 (where \$00 02 = number of data bytes to follow including checksum)

Transmit \$91 (command code)

Transmit RESET (\$00 = Reset unit, \$01 = Reset unit and set all data to default)

Transmit Checksum

Get COMSTAT

Notes

1. When the value \$FB occurs anywhere except in an ADDR header, it is repeated.
2. The data size is the number of bytes, prior to the \$FB repetition, between the command code and the checksum inclusively.
3. The checksum applies to the “data size” bytes through the byte immediately before the checksum, inclusive. Repeated \$FB’s are counted only once. The sum is the two’s complement negative of the LS Byte of the arithmetic sum. For example, if the sum is \$1234, the checksum is \$CC.
4. CHNUM is normally 1 or 2 for a 2-channel device. A CHNUM of 0 is allowed for this message and means both (all) channels. In the case of the ECS, CHNUM = 0. However the command *Program Channel from Memory* allows two special codes. CHNUM = \$01 reprograms only the port data in working Memory from the selected preset Memory. The Input Attenuators, Threshold Levels, and Output Attenuators are *not* affected. CHNUM = \$02 reprograms only the mic data in working Memory from the selected preset Memory. The Gate Depths, Threshold Levels and Gate Releases on all mic channels are *not* affected.
5. The parameter bytes are indexed using a 2-byte number (MSB first) starting with 0. The number of parameter bytes also uses a 2-byte number with the same format. When sending parameters, the number sent is determined by the data size.
6. The working/stored flag is set if the working Memory for either channel doesn’t match the original stored Memory.
7. The working/dirty flag is set when the ECS is powered up, or when a Memory is recalled. It is cleared when the working parameters are sent or received.
8. Near Sig Offset and Prog Sig Threshold are changed when Port 1’s output level is changed and system parameter 17 is ON.
9. If working Memory is transmitted to the unit and the number of Mixer and Mic SPL are greater than 32, the unit will accept the parameters then perform a reset to update the Mixers.
10. All ASCII strings whose lengths are less than the allocated length should be NULL terminated. Otherwise, omit the NULL.
11. ECS termination is optional and is only required if there are more than four ECM 82s. To set the ECS termination remove the top cover of the last ECM 82 on the ECS data interface and move the ECS TERM jumper to its left position.

RW 232 Communications Interface

RW 232 is loosely based on PA-422. One key hardware difference is that RW 232 does not utilize hardware handshaking via DTR/DSR. The beginning of a message always takes the form:

\$FB xx FB xx (where xx = ADDR)

Input port: 9-pin female input port (DB-9F) on device

Output port: 9-pin male output port (DB-9M) on device (for serial linking to the input port on the next device. Up to 16 devices at a time can be linked in this manner.)

Device address means: 8 position DIP switch on device (valid device addresses are 1 through 250)

Baud Rate: 19.2 kilobaud

Character frame bits: 1 start bit, 8 data bits, 1 parity bit (even), and 1 stop bit

Cabling: Use standard RS-232 serial printer or modem cables. **Warning:** *NULL modem cables will not work!*

Host or computer interface: Standard PC serial COM port (DB-9M, or DB-25M with adapter)

Note: *When \$FB appears in the body of the message, it is always repeated.*

Note: *Only three lines, Tx, Rx, and Ground, are used.*

Example Packet Expansion code for RW 232 Messages

```
// 09-10-96 - Devin Cook (Derived from RW232.CPP code)
//-----
// This code only deals with the Body of an RW 232 message (Command/Data)
//
// The steps needed to fully communicate with an RW 232 device are as follows:
//
// 1. Send the Address: [FB xx FB xx]
// 2. Get the returned Device Type and Device ID flags
// 3. Send the FB expanded Body
// 4. Get and check the returned ComStat byte

// Take a simple command and expand it into a full packet.
//
// Input:
//          Buff          - BYTE array with the unexpanded message and lots of extra room
//          MsgLen - Unexpanded message length
//
// Steps required are:
// 1. Add Packet size. This is simply the Command length + 1 for the checksum
// 2. Duplicate 0xFBs
// 3. Calculate Checksum
// 4. Add Checksum to packet (Check for a 0xFB Checksum!)
// 5. Copy Packet back to the buffer
// 6. Return the new Packet Size
//
// Note: The buffer must be large enough to accept the expanded data.
//       No checking is done to verify it is, so be careful!

// A packet into this routine consists of the one byte Command and any Data

int CmdToPacket(BYTE Buff[], int MsgLen)
{
  BYTE L_MSB = ((MsgLen+1) >> 8) & 0xFF;    // Grab MSB of Size
  BYTE L_LSB = (MsgLen+1) & 0xFF;          // Grab LSB of Size

  // FBs is the number of 0xFB bytes in the messages
  int FBs = 0;

  // Don't forget to check message length for FBs
  if (L_MSB == 0xFB)
    FBs ++;

  if (L_LSB == 0xFB)
    FBs ++;

  // Calculate Checksum of Message Length bytes along with bytes in the packet
  int CheckSum = L_MSB + L_LSB;

  for (int x=0;x<L;x++)
  {
    CheckSum += Buff[x];
    if (Buff[x] == 0xFB)
      FBs ++;
  }
}
```