**GETTING STARTED**

Rane RW 232 products can be controlled from remote locations with the RPD 1 Programmable Diagnostics Unit. During transmission, the modem can send and receive data for remote system diagnostics.

There are 2 operational modes for the RPD 1:

- RW 232 remote diagnostics
- RS-232 remote diagnostics or data transmission using the USER DATA port.

**RW 232 RaneWare Diagnostics**

RW 232 remote programming and diagnostics are performed to a remote RPD 1/RW 232 site using a 28.8 kbs or better modem and a PC running RaneWare with Remote to RPD 1 selected on the System Setup page at the host. The remote RPD 1 must be set with Answer Voice unchecked and Answer When set to Always. When Remote to RPD 1 is selected at the host, select System > Dial. Enter the phone number and password of the remote RPD 1. The call is placed with the Dial button. If the modems connect and the password is correct, you will be directly connected to the remote RPD 1's RW 232 Output and its RW 232 Input will be disabled from the control system. (See Remote RW 232 Diagnostics on page Manual-8.)

**RS-232 Serial Interface Diagnostics**

RS-232 serial communications are performed to a remote RPD 1 site using any terminal program and a 28.8 kbs or better modem. The remote RS-232 device is connected to the RPD 1's User Data Port. The remote RPD 1 must be set with Answer Voice unchecked and Answer When set to Always. Once connected to the remote RPD 1, enter $$ to place the RPD 1 in terminal mode, which operates the RPD 1 like a computer bulletin board. To go any further a valid User Name and Password must be entered. Once you have been granted entry, set the route to the User Data Port (see Remote RS-232 Diagnostics on page Manual-9).

**WEAR PARTS:** This product contains no wear parts.
AUDI O OUT SIG indicator: Lights when the Audio Out signal is above -25 dBu. Use to check signal flow.

2. AUDIO OUT OL indicator: Lights when the Audio Out signal is 2 dB before clipping.

3. AUDIO IN SIG indicator: Lights when the Audio In signal is above -25 dBu. Use to check signal flow.

4. AUDIO IN OL indicator: Lights when the Audio In signal is 2 dB before clipping.

5. STATUS—MODEM RX indicator: Lights when receiving data from Modem.

6. STATUS—MODEM TX indicator: Lights when transmitting data to Modem.

7. STATUS—MODEM AA indicator: Lights when Modem is sent an Auto Answer command.

8. STATUS—MODEM OH indicator: Lights when Modem is sent an Off Hook command.

9. STATUS—UDP RX indicator: Lights when receiving data to the User Data Port.

10. STATUS—UDP TX indicator: Lights when transmitting data from the User Data Port.

11. STATUS—ROUTE RW indicator: Lights when the Modem is routed through RW 232.

12. STATUS—ROUTE UDP indicator: Lights when Modem is routed through the User Data Port.

13. COM indicator: Flashes randomly when receiving valid data from the control system or PC. If the DEVICE ADDRESS is not within a valid range (1-250), this LED flashes steadily at ½ second intervals.

14. POWER indicator: Lights when the processor is operational.

RPD 1 MODEM COMPATIBILITY

The modem to be used with the RPD 1 must meet these criteria:
1. 28.8 kbps minimum speed.
2. External
3. Hayes compatible.
① POWER input connector: *Use only a model RS 1 or other power supply approved by Rane.* This unit is supplied with a remote power supply suitable for connection to this input jack. *This is *not* *a telephone jack. The RPD 1 is a modem interface, not a telephone interface.* The power requirements call for an 18 VAC center-tapped transformer only. Using any other type of unapproved supply may damage the unit and void the warranty.

② RW 232 CONTROL - OUTPUT: This DB-9 male connects to downstream Rane RW 232 units. Refer to Appendix-Data Connections on page Manual-10.

③ RW 232 CONTROL - INPUT: This DB-9 female connects to the RW 232 controller, computer, or other Rane RW 232 unit connected upstream. Refer to Appendix-Data Connections on page Manual-10.

④ RW 232 CONTROL - DEVICE ADDRESS: The RPD 1 requires setting of this RW 232 address. See page Manual-5.

⑤ USER DATA (RS-232): This DB-9 User Data Port connects the RPD 1 to the Room Controller’s program port or the Room’s remote data transmission device, such as a PC. Refer to Appendix-Data Connections on page Manual-10.

⑥ MODEM (RS-232): This DB-25 male connects RS-232 data of the RPD 1 to the Modem’s RS-232 data connector (cable provided).

⑦ MODEM MIC: This output section of the Euroblock connects to a 1/8" mini-plug Modem Mic input connector (cable provided). Do not connect the ring on this mini-plug.

⑧ MODEM SPKR: This input section of the Euroblock connects to a 1/8" mini-plug Modem Speaker output connector (cable provided). Do not connect the ring wire from the Modem.

⑨ AUDIO OUT: This same Euroblock delivers a balanced line level signal. AUDIO OUT typically connects to Port 6 Input from the ECB 6.

⑩ AUDIO IN: This 5-pin Euroblock accepts a balanced line-level signal. AUDIO IN typically connects to the Port 6 Output from the ECB 6.
**SETTING THE DEVICE ADDRESS**

The Device Address is set using a binary code which may be determined using the following table, our Windows Address Calculator program, or by adding the place values (1-128) silkscreened on the chassis. *Ignore all numbers printed directly on the switch.* For example, turning ON the switches labeled ‘1’ and ‘2’ yields address ‘3’. In the following table, 0 means switch down (OFF), 1 means switch up (ON), and the left-most digit corresponds to the switch labeled ‘128’.

Rane also provides a special calculator to assist in setting the dip switches. After installing the software, in the RaneWare program group, launch the RaneWare 232 Address Calculator. This binary calculator converts decimal numbers into corresponding dipswitch settings.

<table>
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<th>Decimal</th>
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RANEWARE OPERATION

RaneWare Installation follows a typical Windows software procedure, whether RaneWare is downloaded from the web or from the floppy supplied with your RW 232 unit. For step-by-step installation details, refer to your RPM 26v, RPE 228d, or ECS RaneWare Manual. Software updates can be obtained at Rane's web site, www.rane.com.

SYSTEM REQUIREMENTS

- RaneWare works under Microsoft Windows 3.1, NT, 95 or 98, on a PC or laptop with an unused serial port.
  *Note: Windows 3.1 will not be supported after 12/31/99.*

- The modem to be used with the RPD 1 must meet these criteria:
  1. 28.8 kbps minimum speed.
  2. External
  3. Hayes compatible.

- 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.

- RaneWare can be fully demonstrated and operated without any unit attached (called ‘offline”).

- 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.

DEVICE SELECTION

The quickest way to get to the RW 232 Device Edit screen is to click the Device button on the far right side of the toolbar. When pressed, a list of the first fifteen connected devices appears. Click one of the devices—either an offline device or an actual device—and the Selected device’s edit screen appears. The Selected device name is displayed at the top within the title bar.

Alternatively, after Polling, the same Device list appears in the Device Selection window. You can also get there via Device > Select. Choose the connected or Offline device from the list and click OK. The connected unit’s Device Address will be displayed within brackets [ ] to the left of the device name. Double-clicking on the device name is equivalent to Selecting the device and clicking OK.

If the installation changes by adding more RW 232 units, choose Device > Select, and the Poll button to make the computer recognize currently connected units.
Device > Setup RPD Modem window

**Modem Init** - Example string:
- `AT&FE0#CID=1#CLS=8#VBT=1#VLS=6L0`
  - **&F**: Reset
  - **E0**: No Echo
  - **#CID=1**: Caller ID
  - **#CLS=8**: Voice Mode
  - **#VBT=1**: Set DTMF tone length 100ms
  - **#VLS=6**: Speaker Phone Mode
  - **L0**: Set speaker level to minimum

**Dial Data** - Example: `AT#CLS=0DT`
- **#CLS=0**: Data Mode
- **DT**: Dial Command

**Dial Voice** - Example: `AT#CLS=8#VTS=`
- **#CLS=8**: Voice Mode
- **#VTS**: Dial Voice Command

**Dial DSVD** - Example: `AT-SSE=1DT`
- **-SSE=1**: DSVD Mode
- **DT**: Dial Command

**Answer Data** - Example: `AT#CLS=0A`
- **#CLS=0**: Data Mode
- **A**: Answer

**Answer Voice** - Example: `AT#CLS=8A`
- **#CLS=8**: Voice Mode
- **A**: Answer

**Answer DSVD** - Example: `AT-SSE=1#CLS=0A`
- **-SSE=1**: DSVD Mode
- **#CLS=0**: Data Mode
- **A**: Answer

**Speaker Set** - Example: `A#SPK=1,6,0`
- **#SPK=1,6,0**: (mic on, speaker attenuation, mic gain)
  - **Mic on=1**, **Mic Mute=0**, **Room Monitor=2**
  - Speaker attenuation in 2 dB steps, (0-15) 0=Max; 6=-12 dB
  - Mic Gain (0-3) 0=0 dB, 1=6 dB, 2=9.5 dB, 3=12 dB

**REMOTE RW 232 DIAGNOSTICS**

All that is required to perform remote diagnostics is a PC running Windows® with a 28.8 kb modem or better, with RaneWare® installed. This procedure calls a remote RW 232 site and operates it as if you are there.

1. Launch RaneWare.
2. Click the **Device** button and select any of the Offline RW 232 devices.
3. Select System > **System Setup**.

**RPD 1 DEVICE EDIT**

**Answer after Rings** - determines the number of ring signals that will pass before the RPD 1 and modem will answer.

**Answer Voice** - determines if the RPD 1 and the attached modem will answer in voice or data mode.

**Answer When** - Sets the auto answer mode.

**Remote RW 232 Diagnostics**

**Device > Setup RPD Modem window**

**Modem Init** - Example string:
- `AT&FE0#CID=1#CLS=8#VBT=1#VLS=6L0`
  - **&F**: Reset
  - **E0**: No Echo
  - **#CID=1**: Caller ID
  - **#CLS=8**: Voice Mode
  - **#VBT=1**: Set DTMF tone length 100ms
  - **#VLS=6**: Speaker Phone Mode
  - **L0**: Set speaker level to minimum

**Dial Data** - Example: `AT#CLS=0DT`
- **#CLS=0**: Data Mode
- **DT**: Dial Command

**Dial Voice** - Example: `AT#CLS=8DT`
- **#CLS=8**: Voice Mode
- **DT**: Dial Command

**Dial DSVD** - Example: `AT-SSE=1DT`
- **-SSE=1**: DSVD Mode
- **DT**: Dial Command

**Answer Data** - Example: `AT#CLS=0A`
- **#CLS=0**: Data Mode
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**Answer DSVD** - Example: `AT-SSE=1#CLS=0A`
- **-SSE=1**: DSVD Mode
- **#CLS=0**: Data Mode
- **A**: Answer

**Speaker Set** - Example: `A#SPK=1,6,0`
- **#SPK=1,6,0**: (mic on, speaker attenuation, mic gain)
  - **Mic on=1**, **Mic Mute=0**, **Room Monitor=2**
  - Speaker attenuation in 2 dB steps, (0-15) 0=Max; 6=-12 dB
  - Mic Gain (0-3) 0=0 dB, 1=6 dB, 2=9.5 dB, 3=12 dB

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4. Select the Serial Port that the modem is connected to.

5. Select the RPD 1 (Modem) checkbox. Click OK.


7. Enter the remote site’s Phone Number, User Name and Password. User Name and Password are case sensitive, so be aware of what case the initial password was set.

8. Click the Dial button.

9. Once connected to the remote site, select Device > Select to bring up the Device Selection page.

10. Click POLL to locate the remote devices.

11. The remote devices are under your control. Any local devices will not be affected while Remote to RPD 1 is Selected under System Setup. During the remote session, RPD 1’s RW 232 CONTROL INPUT connector is disconnected. Thus the local controller or PC will not operate the system until the session terminates.

REMOTE RS-232 DIAGNOSTICS

All that is required to perform remote diagnostics is a PC running Windows® with a 28.8 kb modem or better and any terminal program. This procedure calls a remote RS-232 site and operates it as if you are there. Commands are as follows.

ATZ (reset modem)  
OK  
ATDT ******* (dial phone number)  
CONNECT 19200  
$$ (to place RPD 1 in terminal mode)  

Welcome to:  
RW 232 Remote  
Phone Line 1  
RPD Modem  

You are connected to a Rane RPD 1 Modem in terminal mode.  
Username: Rane (enter User Name of the RPD 1)  
Password: 1 (enter Password of the RPD 1[default=1])  
Entry Granted.  
Command (? for help)>?

-+- Menu Commands -+-  
?=Help  
X=Display Device State  
R=Set Data Router  
Q=Quit menu mode  
Command (? for help)>  
Route Modem port to (I=int, U=User Data Port, R=RW 232 port): U  
Connecting User Data port to Modem port…  

Command (? for help)> (Once connected to the User Data Port, you are connected to the remote device connected to this port.)  

+++ATH (to end this session)  
OK
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 the computer:
Set the DEVICE ADDRESS to a unique small number, and try polling for units in RaneWare (under Poll in the Device menu). The unit should be found quickly.

Check that the COM port selected in RaneWare (under System Setup in the Setup menu) 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 RPD 1 rear.

FCC NOTICE
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of the equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense. Changes or modifications not expressly approved by Rane Corporation could void the user’s authority to operate the equipment.

CANADIAN EMC NOTICE
This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

APPENDIX—DATA CONNECTIONS

To control the units from a computer, use nine-pin RS-232 cables 50 feet or shorter. The cable must not be a null-modem type. A short cable is supplied for connecting adjacent units. Daisy-chain up to 16 units at a time by connecting the COM port on the computer to the INPUT connector on the first unit, and the OUTPUT of each unit to the next unit’s INPUT. Since RS-232 can pass through RW 232, additional RS-232 devices may be attached at the end of the RW 232 chain.

I = Input to RPD 1 O = Output from RPD 1

MODEM CONNECTOR PIN-OUT

DB-25 Male

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USER DATA PORT CONNECTOR PIN-OUT

DB-9 Female

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CABLES

DB 9 Male (Hayes Modem) to DB 25 Female (RPD 1)

Hayes Modem | RPD 1

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<td>20</td>
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<tr>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>22</td>
</tr>
</tbody>
</table>

DB 9 Male (RPD 1) to DB 9 Female (AMX Program Port)

RPD 1 | AMX

<table>
<thead>
<tr>
<th>Pin</th>
<th>Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
APPENDIX—RPD 1 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’.

RPD 1 Stored Parameter List (SPL)

<table>
<thead>
<tr>
<th>Index</th>
<th>Name</th>
<th>Encoding Method</th>
<th>System Parameters:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Reserved</td>
<td>Set to 0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Auto-Answer Ring Count</td>
<td>0-9 (byte)</td>
<td>0 = answer after 1 ring, 1 = answer after two rings, etc.</td>
</tr>
<tr>
<td>2</td>
<td>Answer Mode</td>
<td>0/1/2 (byte)</td>
<td>0 = Data, 1 = Voice, 2 = DSVD</td>
</tr>
<tr>
<td>3</td>
<td>Answer When</td>
<td>0/1/2 (byte)</td>
<td>0 = Never, 1 = Once, 2 = Always</td>
</tr>
</tbody>
</table>

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

Device-type code (DT):
$27 = RPD 1

Manufacturer’s identification code (ID):
$08 = Rane Corporation

Channel number codes (CHNUM):
Always set to $00

Memory number codes (MEMNUM):
$00 = live or working memory, $01 = preset memory #1, $02 = preset memory #2, ... , $10 = preset memory #16 (RPD 1 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
**RW 232 Commands**

**Send data (SPL) to channel (81 hex):**
Transmit ADDR header ($FB xx FB xx, where xx = ADDR)
Get DT
Get ID
Transmit $00 $0A (where $00 $0A = number of data bytes to follow including checksum)
Transmit $81 (command code)
Transmit $00 (CHNUM)
Transmit MEMNUM
Transmit 2 bytes; the starting SPL param byte index (See Note 4)
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 $00 (CHNUM)
Transmit MEMNUM
Transmit Checksum
Get COMSTAT

**Program all channels of all devices from memory (82 hex):**
Transmit SFB $00 SFB $00
Transmit $00 $03 (where $00 $03 = number of data bytes to follow including checksum)
Transmit $82 (command code)
Transmit MEMNUM
Transmit Checksum
Get COMSTAT

**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 all channels of all devices (87 hex):**
Transmit SFB $00 SFB $00
Transmit $00 $02 (where $00 $02 = number of data bytes to follow including checksum)
Transmit $87 (command code)
Transmit $77 (Checksum)
Unmute 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)

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 OPSTAT
Get Checksum
Get COMSTAT

OPSTAT consists of 8 bytes returned in this order:

<table>
<thead>
<tr>
<th>Byte</th>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OPSTAT</td>
<td>See OPSTAT return values on Page 4</td>
</tr>
<tr>
<td>2</td>
<td>Preset Memory</td>
<td>1-16</td>
</tr>
<tr>
<td>3</td>
<td>Working/stored flag</td>
<td>1/0 (See Note 5)</td>
</tr>
<tr>
<td>4</td>
<td>Working/dirty flag</td>
<td>1/0 (See Note 6)</td>
</tr>
<tr>
<td>5</td>
<td>Ring Count</td>
<td>0-9, 0 = 1 ring, 1 = 2 rings, 2 = 3 rings, etc.</td>
</tr>
<tr>
<td>6</td>
<td>Off Hook</td>
<td>0/1, 0 = ON, 1 = OFF</td>
</tr>
<tr>
<td>7</td>
<td>Carrier Detect</td>
<td>0/1, 0 = ON, 1 = OFF</td>
</tr>
<tr>
<td>8</td>
<td>Modem Ready</td>
<td>0/1, 0 = ON, 1 = OFF</td>
</tr>
</tbody>
</table>

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 (SPL) 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 (CHNUM)
Transmit MEMNUM
Transmit 2 bytes; the starting SPL param byte index (See Note 4)
Transmit 2 bytes; the number of SPL parameter bytes (See Note 4)
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 $FC (Checksum)
Get COMSTAT
Send globals (8C hex):
Transmit ADDR header ($FB xx FB xx, where xx = ADDR)
Get DT
Get ID
Transmit $01 $4F (where $01 $4F = number of data bytes to follow including checksum)
Transmit $8C (command code)
Transmit Global Parameters
Transmit Checksum
Get COMSTAT

RPD 1 Global Parameters (333 bytes):

Type: Bytes: Description:
Unit name 16 NULL terminated ASCII string if less than 16 characters long. Otherwise, omit NULL.
Modem ID 8 NULL terminated ASCII string if less than 8 characters long. Otherwise, omit NULL.
User name 8 NULL terminated ASCII string if less than 8 characters long. Otherwise, omit NULL.
Password 8 NULL terminated ASCII string if less than 8 characters long. Otherwise, omit NULL.
Location1 32 NULL terminated ASCII string if less than 32 characters long. Otherwise, omit NULL.
Location2 32 NULL terminated ASCII string if less than 32 characters long. Otherwise, omit NULL.
Modem Init 80 NULL terminated ASCII string if less than 80 characters long. Otherwise, omit NULL.
Modem Dial Data 20 NULL terminated ASCII string if less than 20 characters long. Otherwise, omit NULL.
Modem Dial Voice 20 NULL terminated ASCII string if less than 20 characters long. Otherwise, omit NULL.
Modem Dial DSVD 20 NULL terminated ASCII string if less than 20 characters long. Otherwise, omit NULL.
Modem Answer Data 20 NULL terminated ASCII string if less than 20 characters long. Otherwise, omit NULL.
Modem Answer Voice 20 NULL terminated ASCII string if less than 20 characters long. Otherwise, omit NULL.
Modem Answer DSVD 20 NULL terminated ASCII string if less than 20 characters long. Otherwise, omit NULL.
Modem Voice Speaker & Mic Level 20 NULL terminated ASCII string if less than 20 characters long. Otherwise, omit NULL.
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 that an error occurred, e.g. someone removed the EEPROM while the unit was powered, and that time was restarted from that point.)
Reserved 4 Normally set to 0,0,0,0 (factory use only)

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 SFB SFB (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 (‘10)
Get Checksum (for hardware and software revisions)
Get COMSTAT

Reset Unit (91 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 $91 (command code)
Transmit RESET ($00 = Reset unit, $01 = Reset unit and set all data to default)
Transmit Checksum
Get COMSTAT

Send Modem Command (92 hex)
Transmit: ADDR header ($FB xx FB xx, where xx = ADDR)
Get: DT
Get: ID
Transmit $00 $xx (where $00 $xx = number of data bytes to follow including checksum)
Transmit $92 (command code)
Transmit Modem command
Transmit Data
Transmit Checksum
Get COMSTAT

<table>
<thead>
<tr>
<th>Modem Command</th>
<th>Data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$00</td>
<td>Initialize Modem</td>
</tr>
<tr>
<td>1</td>
<td>‘V’, ‘D’, or ‘S’ + telephone number</td>
<td>NULL terminated ASCII String, Dial modem in Voice, Data, or DSVD mode</td>
</tr>
<tr>
<td>2</td>
<td>‘V’/’D’/’S’</td>
<td>NULL terminated ASCII String, Answer modem in Voice, Data, or DSVD mode</td>
</tr>
<tr>
<td>3</td>
<td>$00</td>
<td>Hang-up Modem</td>
</tr>
<tr>
<td>4</td>
<td>‘I’/’R’/’U’</td>
<td>Modem Data Port Router where ‘I’ = Internal, ‘R’ = RaneWare, ‘U’ = User Data</td>
</tr>
<tr>
<td>5</td>
<td>Raw AT commands</td>
<td>NULL terminated ASCII Strings</td>
</tr>
</tbody>
</table>

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. 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.

5. The working/stored flag is set if the working memory for either channel doesn’t match the stored memory from which it originated.

6. 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.
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)

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

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

References


ANSI S4.49-1991 (American National Standards Institute)
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 ++;
    }
    CheckSum = (256-CheckSum) & 0xFF;

    // Don’t forget to up the FB count for a FB checksum!
    if (CheckSum == 0xFB)
        FBs ++;

    // New Length is:
    // 2 (For 2 length bytes) +
    // L (Old message Length) +
    // Repeated FBs count +
    // 1 (For CheckSum)
    int NewLen = 2 + MsgLen + FBs + 1;

    // Create a temporary holding tank for Packet Expansion
    BYTE Packet[MAX_CMD_BUF];
    BYTE *Ptr = Packet;

    // Stick message length in the packet (Watching for FBs of course)
    *(Ptr++) = L_MSB ;
    if (L_MSB == 0xFB)
        *(Ptr++) = 0xFB;
    *(Ptr++) = L_LSB ;
    if (L_LSB == 0xFB)
        *(Ptr++) = 0xFB;
    *(Ptr++) = CheckSum ;
    if (CheckSum == 0xFB)
        *(Ptr++) = 0xFB;
    *(Ptr++) = FBs ;
}
*(Ptr++) = L_LSB;
if (L_LSB == 0xFB)
*(Ptr++) = 0xFB;

// Expand the original packet into the new buffer
for (x=0;x<L;x++)
{
    *(Ptr++) = Buff[x];
    if (Buff[x] == 0xFB)
        *(Ptr++) = 0xFB;
}

// Add the Checksum byte (or Bytes if Checksum == FB)
*(Ptr++) = CheckSum;
if (CheckSum == 0xFB)
    *(Ptr++) = 0xFB;

// Copy the expanded packet back into the original buffer
memcpy(Buff,Packet,NewLen);
return NewLen;}