Protocol Example Stream for Avcom of Virginia Single Board Remote Spectrum Analyzers

All SBS, CLM and RSA rev B models (1100, 2150, 2500)

Revision History

Release	Reason	By	Date
Rev F	Initial release (starting at F to keep in sync with protocol document)	MC	April 3, 2009
Rev G	Corrected "LNB Power & Fixed LO Offset" Table Added detailed descriptions of bytes in packets	MC	April 9, 2009

Introduction

The avcom revised protocol for SBS, CLM and RSA rev B models is based on a simple request-reply communications.

The following document is meant to be a supplement to the "Protocol for Avcom of Virginia Single Board Based Remote Spectrum Analyzers" document to assist in visualizing the communications between the analyzer and the GUI software.

Communication Steps Described

A simple example of the communication between the analyzer is given below. Communication is always initiated by the GUI software on a PC or SBC and a reply is sent by the analyzer.

Communication

1. GUI tries to communicate with older avcom analyzers first (for backward compatibility with old RSA rev A, PSA-45d, MSA-4570E, PSA-37XP, MSA-45E, etc.)

2. If no reply from older analyzer, GUI tries to communicate with newer protocol analyzers (SBS, CLM, RSA rev B) by requesting a "Hardware Description" packet from the analyzer.

3. If a "Hardware Description" is sent by the analyzer, the GUI assumes it is talking to a new protocol analyzer and can set up it's interface accordingly. The "Hardware Description" sent by the analyzer contains current settings and features, such as current center frequency, span, RBW, reference level, number of inputs, LNB power settings, etc.

4. GUI gets firmware version from Hardware Description packet received in (3).
    a. If firmware version less than 2.6, skip step 5.
    b. If firmware version greater than or equal to 2.6, do step 5.

5. GUI Request a "Get LNB Power & Fixed LO" packet (for firmware version 2.6 and later). The GUI can set up its interface with the information returned by the analyzer gathered from the "LNB Power & Fixed LO" packet.

6. GUI can change the analyzer settings if desired, with the "Change Settings" request. The analyzer will change its settings and reply with a waveform packet containing the current settings.

7. To continue viewing waveforms, the GUI repeatedly requests a single waveform packet using the "Waveform Transmission Settings" request. Request 1 (single) waveform repeatedly as desired.

Communication Example

Notes: Com Port or TCP Port opened prior to communication by process "AVCOM Eng GUI v2841.exe"
Notes: Refer to protocol document for all mediums of communication (USB, Serial, Ethernet) for baud rate, hardware flow control, parity and data bits settings.
Notes: On serial port see notes in protocol document about DTR and RTS.

GUI Request: *Request to startup old protocol analyzer (for backwards compatibility)*	
FE FE FF 00	
Answer from SBS, CLM and RSA rev B: *none*	

GUI Request: *Request to startup old protocol analyzer (for backwards compatibility)*	
FE FE FF 00	
Answer from SBS, CLM and RSA rev B: *none*	

GUI Request: *Get Hardware Description*	
`02 00 03 07 00 03`	**Legend**
	STX or ETX 0x02 = STX (start packet) 0x03 = ETX (end packet) **Length Bytes** 0x0010 = 16 remaining bytes to read **Packet type byte** 0x04 = Change settings packet type **Reserved, not currently used**

Answer from SBS: *Hardware Description*	

`02 00 55 07 5A 02 06 00 00 E4 E1 C0 00 00 C3 50`
`1E 10 78 0A 0B 00 00 01 0D 00 00 00 00 30 30 30`
`30 30 30 30 30 33 30 39 30 32 30 33 32 1B 15 0D`
`14 09 A9 94 AD 00 00 40 3F AA FF FF E8 B1 82 67`
`80 5C 61 6F 9A 80 A1 FF 4B FF FF FF 28 15 15 18`
`62 28 B4 A1 FF FF FF 03`
	Legend

	STX or ETX 0x02 = STX (start packet) 0x03 = ETX (end packet) **Length Bytes** 0x0055 = 85 remaining bytes to read **Packet type byte** 0x07 = Hardware description from analyzer **Unit product ID** 0x5A = SBS-2500 OR RSA-2500 **Firmware version** 0x0206 = Firmware major.minor version = 2.6 **Center frequency** 0x00E4E1C0 = 1500.0000 MHz (Divide by 10000 to get value in MHz) **Span** 0x0000C350 = 5.0000 MHz (Divide by 10000 to get value in MHz) **Reference Level** 0x1E = 30decimal = -30 dBm ref level **RBW** 0x10 = 100kHz RBW **Input** 0x0A = Input 1 (default) **PCB Revision** 0x1A = FAB-08H01-A 0x1B = FAB-08H01-B (current) 0x0A = FAB-08D02-A 0x0B = FAB-08D02-B **Other data bytes** See "Hardware Description Table"

NEW!: If analyzer firmware reported in "Hardware Description" packet is >= 2.6 then include:

GUI Request: *Get LNB Power & Fixed LO Settings*	
02 00 02 0D 03	**Legend**
	STX or ETX 0x02 = STX (start packet) 0x03 = ETX (end packet) **Length Bytes** 0x0002 = 2 remaining bytes to read **Packet type byte** 0x0D = Request LNB power & fixed LO packet

Answer from SBS: *LNB Power & Fixed LO Settings*	
02 00 2D 0D 80 80 11 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 40 40 40 40 40 40 FF FF FF FF FF FF FF FF FF FF 03	**Legend**
	STX or ETX 0x02 = STX (start packet) 0x03 = ETX (end packet) **Length Bytes** 0x002D = 45 remaining bytes to read **Packet type byte** 0x07 = LNB Power and Fixed LO Offset packet **RF LO Offset Mask** 0x80 = Bit set, all low band offset (bit7 always set) (bit 5 – bit 0 for RF Inputs 6-1) 0 = Use LNB Power mask to determine offset 1 = Always use low band offset **LNB Power Mask** 0x08 = Bit set, all use 22kHz (bit7 always set) (bit 5 – bit 0 for RF Inputs 6-1) 1 = uses voltage to select band 0 = uses 22kHz to select band **RF Input Block Power** 0x11 = option is off (subtract 10 decimal to get input value if option is turned ON. Valid input values 0x00-0x05) **Internal extender offsets** For inputs 1-6, two bands each, each band is a signed word (2 bytes) in MHz. Example: 0x05FB 0x05 = +5MHz 0xFB = -5MHz **LNP Power state per input** See LNB Power settings table (bit sets) **Reserved**

END of NEW Packet

GUI Request: *Change Settings*

`02` `00 10` `04` `00 E4 E1 C0` `00 00 C3 50` `1E` `10` `0A` `40 00 00` `03`

Legend

STX or ETX
0x02 = STX (start packet)
0x03 = ETX (end packet)

Length Bytes
0x0010 = 16 remaining bytes to read

Packet type byte
0x04 = Change settings packet type

Center frequency
0x00E4E1C0 = 1500.0000 MHz
(Divide by 10000 to get value in MHz)

Span
0x0000C350 = 5.0000 MHz
(Divide by 10000 to get value in MHz)

Reference Level
0x1E = 30decimal = -30 dBm ref level

RBW
0x10 = 100kHz RBW

Input
0x0A = Input 1 (default)

LNB setting, firmware >= 2.6
0x40 = LNB power off (default settings)

Reserved, firmware >= 2.6

Answer from SBS: *Waveform Packet (including current settings)*

```
02 01 55 09 12 12 10 12 12 12 12 11 11 11 11 12
11 11 11 11 11 11 11 12 11 12 11 12 11 12 12 13
11 11 11 12 12 12 11 11 11 11 11 11 11 11 11 10
11 11 12 11 11 11 12 13 12 11 12 11 11 11 11 12
11 11 12 11 12 11 11 12 11 12 12 12 11 12 12 12
12 13 12 11 11 11 11 12 12 11 12 11 12 10 11 11
11 12 12 12 11 11 12 12 12 12 12 12 12 12 12 13
13 12 12 14 13 13 13 14 14 14 16 16 16 18 16 18
1A 1C 1D 1E 21 23 26 2A 2E 32 36 3B 40 45 4B 51
58 5E 64 6B 71 78 7F 86 8D 95 9C A3 AA B1 B7 BC
C0 C4 C6 C8 C8 C7 C6 C3 C0 BC B8 B2 AD A7 A0 9A
93 8C 85 7F 78 72 6C 65 5F 59 53 4D 47 42 3D 38
33 2E 2B 27 24 21 1F 1D 1B 1A 18 18 17 16 15 14
14 13 13 13 12 14 13 12 12 12 12 12 13 12 13 11
11 12 12 12 12 12 11 11 12 12 12 11 12 12 12 11
11 12 12 11 12 12 11 11 11 11 12 11 11 11 12 11
11 11 12 11 11 12 12 11 11 12 11 11 11 11 11 11
12 10 11 11 11 11 12 12 12 10 12 11 11 10 12 11
11 11 11 11 11 11 11 12 11 10 11 12 12 12 11 12
12 10 11 11 12 12 11 12 11 10 11 12 12 11 10 11
12 12 12 12 5A 00 E4 E1 C0 00 00 C3 50 1E 10 0A
00 00 00 00 40 FF FF 03
```

Legend

See next page for waveform
description.

GUI Request: *WaveformRequest... 1...*

```
02  00 03  03  03  03
```

Legend

STX or ETX
0x02 = STX (start packet)
0x03 = ETX (end packet)

Length Bytes
0x0155 = 341 remaining bytes to read

Packet type byte
0x09 = Waveform packet

Waveform transmit setting
0x03 = Send single waveform packet

Answer from SBS: *Waveform (including current settings)*

```
02  01 55  09  11 11 11 11 12 11 12 11 11 12 11 11
12 11 12 11 11 11 12 12 12 12 11 11 11 11 11 11
12 12 11 11 11 12 12 11 11 11 11 12 11 11 11 11
11 12 12 11 11 12 11 10 11 11 11 11 12 12 12 12
11 12 12 12 11 11 12 11 12 12 11 12 13 11 11 11
11 11 12 11 11 11 12 12 12 11 11 11 11 11 12 13
12 12 11 12 12 12 11 11 11 11 12 12 12 13 12 12
13 13 13 13 13 12 13 13 14 14 15 15 17 16 17 18
19 1B 1D 1F 21 24 27 2A 2E 32 36 3B 40 46 4C 51
58 5E 64 6B 71 78 7F 86 8D 94 9C A3 AA B1 B7 BC
C0 C4 C6 C7 C8 C7 C6 C3 C0 BC B8 B2 AD A7 A0 9A
93 8C 85 7F 78 72 6B 65 5F 59 53 4D 47 42 3C 38
33 2F 2B 27 24 21 1F 1C 1C 1A 19 18 17 16 15 14
14 15 13 13 14 13 12 12 12 11 13 12 12 12 12 11
13 11 12 11 12 11 12 11 11 11 11 11 11 12 12 12
12 12 11 11 11 12 12 11 11 12 12 12 12 12 12 13
12 12 12 12 12 11 12 11 11 12 10 12 11 11 12 11 12
12 11 11 11 11 12 12 13 12 12 12 11 11 11 11 12
11 12 11 11 11 11 12 11 11 10 10 11 11 12 11 12
12 11 11 11 11 11 11 10 12 11 11 12 10 12 11 12
11 12 11 11  5A  00 E4 E1 C0  00 00 C3 50  1E  40  0B
00 00 00 00  40  FF FF  03
```

Legend

STX or ETX
0x02 = STX (start packet)
0x03 = ETX (end packet)

Length Bytes
0x0155 = 341 remaining bytes to read

Packet type byte
0x09 = Waveform packet

Waveform data bytes
y[dB] = 0.2 * DataByte + (reflvl[dBm] – 40 dBm)

Unit product ID
0x5A = SBS/CLM/RSA-2500

Center frequency
0x00E4E1C0 = 1500.0000 MHz

Span
0x0000C350 = 5.0000 MHz

Reference Level
0x1E = 30decimal = -30 dBm ref level

RBW
0x40 = 1MHz RBW

Input
0x0B = Input 2

Internal extender
0x0000 = no internal extender

External extender
0x0000 = no external extender

LNB setting, firmware >= 2.6
0x40 = LNB power off (default settings)

Reserved, firmware >= 2.6

GUI Request: *WaveformRequest... 2...3...N (as long as desired)*

`02 00 03 03 03 03`

Answer from SBS: *Waveform (including current settings)*

```
02 01 55 09 12 11 12 11 11 11 12 12 11 11 11 12
12 11 12 11 11 11 11 11 11 11 12 11 11 11 12 11
12 12 11 11 11 12 11 12 12 11 12 11 12 12 11 12
11 11 11 11 12 11 11 11 11 11 11 10 12 11 11 11
11 11 11 11 13 11 12 11 11 11 12 11 12 12 11 12
12 11 12 12 12 12 12 11 11 11 12 11 11 12 12 12
11 11 11 12 12 11 12 12 12 12 12 12 12 13 12 12
12 13 13 12 13 13 13 14 15 15 15 17 17 16 17 19
19 1B 1D 20 22 23 26 2A 2E 31 36 3B 40 46 4B 51
58 5E 64 6B 71 78 7F 86 8D 95 9C A3 AA B1 B6 BC
C0 C4 C6 C7 C8 C7 C6 C3 C0 BC B8 B3 AD A7 A0 9A
93 8C 86 7F 78 72 6B 65 5F 59 53 4D 47 42 3D 38
32 2E 2A 27 23 21 20 1D 1C 19 19 18 17 16 16 15
14 15 14 14 13 12 12 13 13 13 12 11 12 12 11 13
12 12 12 12 11 12 11 12 12 12 12 11 11 11 11 12
12 13 12 12 11 11 10 11 11 12 11 11 11 11 12 12
12 12 12 12 12 11 11 12 11 12 11 11 11 11 11 12
12 12 12 12 11 11 11 12 12 12 12 11 12 12 11 11
11 11 11 12 12 11 11 11 11 11 11 12 11 11 11 11
11 11 11 11 12 12 11 11 11 12 11 12 11 11 11 12
12 12 11 12 5A 00 E4 E1 C0 00 00 C3 50 1E 10 0A
00 00 00 00 40 FF FF 03
```