AFE4404 Demonstration Kit

Message Communication Protocol v4.0

Texas Instruments

Message Communication Protocol for AFE4404 EVM

This document describes the message communication protocol for AFE4404 EVM. The message communication protocol applies to AFE4404 EVM with AFE4404EVM GUI version 1.0 or higher.

Command Format

1. Write Register Command

PC to EVM: 0x02 <2 bytes of ASCII addr with MSB first> <6 bytes of ASCII data with MSB first> 0x0D
e.g, to write a value of 0x456789 to address 0x12, message format is
"0x02 0x31 0x32 0x34 0x35 0x36 0x37 0x38 0x39 0x0D"

Byte Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Description	Write Reg Command	ASCII addr MSB	ASCII addr LSB	ASCII data MSB	ASCII data	ASCII data	ASCII data	ASCII data	ASCII data LSB	End of packet
Payload	0x02	0x31	0x32	0x34	0x35	0x36	0x37	0x38	0x39	0x0D

The Write Register command is called from the AFE4404 GUI, whenever the user has changed or updated any of the high level controls or modified the register fields in the Low level Configuration in the Device Configuration tab.

2. Read Register Command:

PC to EVM: 0x03 <2 bytes of ASCII addr with MSB first> 0x0D
e.g, to read address 0x12, the message format is

Byte Number	**1**	**2**	**3**	**4**
Description	Read Reg Command	ASCII addr MSB	ASCII addr LSB	End of packet
Payload	0x03	0x31	0x32	0x0D

EVM to PC: 0x03 0x02 <3 bytes of raw data with LSB first> 0x03 0x0D
e.g, if the data read is 0x456789, the message format is

Byte Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Description	Read Reg Command	Start of data	Raw data LSB	Raw data	Raw data MSB	End of data	End of packet
Payload	0x03	0x02	0x89	0x67	0x45	0x03	0x0D

The Read Register command is issued from the Low Level Configuration tab of Device Configuration of the AFE4404 GUI when the user clicks on Read Selected  or Read All  buttons. The GUI updates the register map (along with the respective high level control) based on the response from the AFE.

3. Start Read ADC Register Command:

PC to EVM: 0x01 0x2A <8 ASCII bytes of N packets with MSB first> 0x0D
Example1: to capture 1024 packets, PC sends: "0x01 0x2A 0x30 0x30 0x30 0x30 0x30 0x34 0x30 0x30 0x0D"
Example2: to capture 70000 packets, PC sends: "0x01 0x2A 0x30 0x30 0x30 0x31 0x31 0x31 0x37 0x30 0x0D"
For continuous data, PC sends 0 as the number of the packets.
Example: to capture continuous data, PC sends: "0x01 0x2A 0x30 0x30 0x30 0x30 0x30 0x30 0x30 0x30 0x0D"

EVM sends N packets with each packet having the following format:
EVM to PC: 0x01 0x02 <18 bytes of 6 channel data with LSB first> 0x03 0x0D

Byte Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Description	Start Read ADC Reg Command	Start of data	LED2 data LSB	LED2 data	LED2 data MSB	LED2AMB data LSB	LED2AMB data	LED2AMB data MSB
Payload	0x01	0x02						

Byte Number	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Description	LED1 data LSB	LED1 data	LED1 data MSB	LED1AMB data LSB	LED1AMB data	LED1AMB data MSB	LED2 – LED2AMB data LSB / Don't care when calibration enabled	LED2 – LED2AMB data / Don't care when calibration enabled
Payload								

Byte Number	**17**	**18**	**19**	**20**	**21**	**22**
Description	LED2 – LED2AMB data MSB / Don't care when calibration enabled	LED1 – LED1AMB data LSB / Don't care when calibration enabled	LED1 – LED1AMB data / Don't care when calibration enabled	LED1 – LED1AMB data MSB / Don't care when calibration enabled	Don't Care	End of packet
Payload					XX	0x0D

The Start Read ADC Register command is issued when the user clicks on the Capture button under ADC Capture & Analysis tab. Depending on the capture mode selected (Finite or Continuous) and the number of samples to capture, the GUI sends the number of data packets to capture. For continuous data, the GUI sends 0 as the number of the packets. Each data packet contains all the 6 ADC result registers along with header and trailer data in the payload.

Note: The Start Read ADC Register Command assumes that the AFE has been configured correctly to read the ADC result registers.

4. Stop Read ADC Register Command:

PC to EVM: 0x06 0x0D
Note: Clear the USB/ COM port buffer before a Start Read ADC Register command is issued.

Byte Number	**1**	**2**
Description	Stop Read ADC Reg Command	End of packet
Payload	0x06	0x0D

The Stop Read ADC register command is issued when the GUI has received the total number of data packets sent during the Start Read ADC register command.

5. Device Identification Command:

PC to EVM: 0x04 0x0D

Byte Number	**1**	**2**
Description	Device Identification Command	End of packet
Payload	0x04	0x0D

AFE4404EVM to PC: 0x04 0x02 0x34 0x34 0x30 0x34 0x03 0x0D

Byte Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Description	Device Identification Command	Start of data	ASCII byte	ASCII byte	ASCII byte	ASCII byte	End of data	End of packet
Payload	0x04	0x02	0x34	0x34	0x30	0x34	0x03	0x0D

When the GUI is started, the Device Identification command is issued by the GUI to identify the EVM connected to the PC. The firmware returns the appropriate response mentioned above. The EVM connected to the PC will be listed in the Global settings tab under Device Configuration.

6. Firmware Upgrade Command:

PC to EVM: 0x05 0x0D
After the GUI issues the command, the PC invokes user interactive executable to upgrade the firmware.

Byte Number	**1**	**2**
Description	Firmware Upgrade Command	End of packet
Payload	0x05	0x0D

The GUI issues the Firmware Upgrade command when the user clicks on **Help** and then **Firmware Upgrade** on the Menu bar. After the GUI issues the command, the PC invokes user interactive executable to upgrade the firmware.

7. Firmware Revision Command:

PC to EVM: 0x07 0x0D

Byte Number	**1**	**2**
Description	Firmware Revision Command	End of packet
Payload	0x07	0x0D

EVM to PC: 0x07 0x02 FW_MAJOR FW_MINOR 0x03 0x0D
E.g., for rev 1.0, FW_MAJOR 1
FW_MINOR 0

Byte Number	**1**	**2**	**3**	**4**	**5**	**6**
Description	Firmware Revision Command	Start of data	byte	byte	End of data	End of packet
Payload	0x07	0x02	0x01	0x00	0x03	0x0D

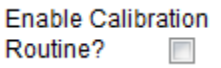
When the GUI is started, the Firmware revision command is issued to identify the firmware revision. The firmware revision will be listed in the Global settings tab under Device Configuration.

8. Calibration Enable Command:

PC to EVM: 0x08 0x54 0x0D
After the GUI issues the command, the automatic gain calibration routine is invoked in the firmware.

Byte Number	**1**	**2**	**3**
Description	Calibration Command	Calibration Enable	End of packet
Payload	0x08	0x54	0x0D

The Calibration Enable command is sent by the GUI when the user checks the Enable Calibration Routine



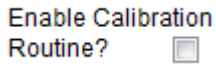
under ADC Capture & Analysis tab. After the GUI issues the command, the automatic gain calibration routine is initialized and invoked in the firmware waiting for the user input to start capturing the data.

9. Calibration Disable Command:

PC to EVM: 0x08 0x46 0x0D
After the GUI issues the command, the automatic gain calibration routine is disabled.

Byte Number	**1**	**2**	**3**
Description	Calibration Command	Calibration Disable	End of packet
Payload	0x08	0x46	0x0D

The Calibration Disable command is sent by the GUI when the user unchecks the Enable Calibration Routine



under ADC Capture & Analysis tab.