Each slave device on the bus is assigned a unique address between 0 and E. The host computer is the master of the bus, while the SEI Devices are slaves. Slaves cannot initiate communication, rather the host sends commands and the devices respond. The first byte of a command always includes the address of the device to be selected. Address F is used to communicate to all devices on the bus at once. A device responds by activating the busy line if a valid command is received with the correct address. If the address is incorrect or the command is invalid (including framing errors), the device ignores the command. If the address is F, all devices activate the busy line until the command is processed by everyone (wired-OR). If a device has the busy line active while processing a command, other devices ignore all data.

In the case of a single-byte command, the host only sends one byte which contains the address and the command. The selected device activates the busy line, sends the response, and then releases the busy line.

In the case of a multiple-byte command, the host only sends the first byte which contains the address. The selected device activates the busy line to acknowledge the selection. The host sends the rest of the command and the busy line remains active until the particular command in completed.

In the simplest single device configuration, if factory default modes don't need to be changed, only single-byte commands are needed.

Large numbers are transmitted with the most significant byte first.

Single Byte User Commands:

Request Command:

7	6	5	4	3	2	1	0
cmd3	cmd2	cmd1	cmd0	addr3	addr2	addr1	addr0

Addr3-0: Address of encoder to be selected (0 to E). Address F selects any and all encoders on the bus. If there is only one encoder on the bus, address F can be used for all operations. If there are multiple encoders on the bus, address F is only useful for a few commands.

cmd3-cmd0	request type
0000	(reserved for control codes)
0001	Get Position, Port 1
0010	Get Position, Port 2
0011	Get Position, Port 3
0100	Get Position, Port 4
0101	Get All Positions
1011	Reset Port 1
1100	Reset Port 2
1001	Reset Port 3
1110	Reset Port 4
1111	(multiple byte command)

Get Position: The AD5 sends the current position of the specified port in 4 bytes, most significant byte first.

Get All Positions: The AD5 sends the current position of all 4 ports: Port1 to port4, most significant byte first.

Reset: The AD5 resets the counter of the specified port to zero, then responds back to the master with the single byte checksum.

Multiple Byte Commands:

All multiple byte commands start with the request byte F0+addr. After receiving this byte, the addressed device will acknowledge by activating the busy line. After the acknowledgment, the device is ready to receive the rest of the command. Some commands may require the use of address F to select all devices on the bus (like check serial number, baud rate change, etc.). When addressing multiple devices, after the first busy received, wait 5msec to send the rest of the command, this ensures that they are all ready. When the command is successfully completed, the device sends a checksum byte and then releases the busy line. If the command is invalid or failed, the device releases the busy line without sending a checksum. The checksum byte is the exclusive OR of the request byte, command bytes, and bytes returned by the device.

Set Position Command:
Port 1: 6 bytes: request byte, 0x02, 4 bytes pos (MS to LS)
Port 2: 6 bytes: request byte, 0x12, 4 bytes pos (MS to LS)
Port 3: 6 bytes: request byte, 0x13, 4 bytes pos (MS to LS)
Port 4: 6 bytes: request byte, 0x14, 4 bytes pos (MS to LS)
Returns checksum if command is successful.
Sets the port counter to the given position.
Position must be from -8,388,608 to 8,388,607.

Read Serial Number:
2 bytes: request byte, 03
Returns 5 bytes: 4 bytes serial number and checksum if command is successful.

Check Serial Number:
10 bytes: request byte, 04, 4 bytes serial number, 4 bytes mask
Returns nothing.
The device does a logical AND of its serial number with the mask supplied. The result is compared to the serial number supplied. If they match, the busy line is held active until another byte is received. Otherwise the busy line is released. This command is used to determine if a device with a particular serial number is present on the bus.

Fail Serial Number:
10 bytes: request byte, 05, 4 bytes serial number, 4 bytes mask
Returns nothing.
The device does a logical AND of its serial number with the mask supplied; the result is compared to the serial number supplied. If they don't match, the busy line is held active until another byte is received. If they match the busy line is released. This is useful to determine if a device, whose serial number is known, is the only one on the bus.

Get Address:
6 bytes: request byte, 06, 4 bytes serial number
Returns 2 bytes: 1 byte address and checksum if command is successful, only if serial number matches.
The device compares its serial number with the one supplied; if they match, it returns its address (0 to E). Otherwise, it returns nothing.

Assign Address:
7 bytes: request byte, 07, 4 bytes serial number, 1 byte address
Returns checksum if command is successful.
The device compares its serial number with the one supplied; if they match, it assigns itself the address supplied (must be between 0 and E). The new address is stored in EEPROM, therefore, it will be effective after resets and power downs.

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Read Factory Info:
2 bytes: request byte, 08
Returns 15 bytes: 2 bytes model number, 2 bytes version, 2 bytes configuration, 4 bytes serial number, month, day, 2 bytes year and checksum if command is successful.

Read Resolution Register Command:
Port 1: 2 bytes: request byte, 0x21
Port 2: 2 bytes: request byte, 0x22
Port 3: 2 bytes: request byte, 0x23
Port 4: 2 bytes: request byte, 0x24
Returns 3 bytes: resolution MS byte, resolution LS byte and checksum if command is successful.
The resolution register does not modify the count value from the AD5, the count is modified by the software which reads the resolution register.

Change Resolution Register Command:
Port 1: 4 bytes: request byte, 0x31, 2 bytes resolution (MS to LS)
Port 2: 4 bytes: request byte, 0x32, 2 bytes resolution (MS to LS)
Port 3: 4 bytes: request byte, 0x33, 2 bytes resolution (MS to LS)
Port 4: 4 bytes: request byte, 0x34, 2 bytes resolution (MS to LS)
Returns checksum if command is successful.
The resolution can be any number between 2 and FFFF.

Read CMR Command:
Port 1: 2 bytes: request byte, 0x45
Port 2: 2 bytes: request byte, 0x46
Port 3: 2 bytes: request byte, 0x47
Port 4: 2 bytes: request byte, 0x48
Returns 1 byte CMR if command is successful.
For information on the CMR, see the LS7266R1 data sheet.

Change CMR Command:
Port 1: 3 bytes: request byte, 0x41, 1 byte CMR
Port 2: 3 bytes: request byte, 0x42, 1 byte CMR
Port 3: 3 bytes: request byte, 0x43, 1 byte CMR
Port 4: 3 bytes: request byte, 0x44, 1 byte CMR
Returns checksum if command is successful.
The CMR allows you to change Count Mode and Quadrature Settings. For Quad 1, Quad 2, and Quad 4 send 0xA8, 0xB0, and 0xB8, respectively. The CMR value is stored in EEPROM, so it will be retained after the unit is powered down. For information on the CMR, see the LS7266R1 data sheet.

Read Mode Command:
2 bytes: request byte, 0B
Returns 2 bytes: mode and checksum if command is successful.
See **"Change Mode Command"** on page 2 for definition of mode byte.

Change Power Up Mode Command:
3 bytes: request byte, 0D, mode
Returns checksum if command is successful.
Same as **"Change Mode Command"**, except the mode is stored in EEPROM, therefore it will be effective after resets and power downs.
See **"Change Mode Command"** on page 2 for definition of mode byte.

Change Mode Command (temporary):
3 bytes: request byte, 0C, mode
Returns checksum if command is successful.
The mode is changed temporarily and will be effective until the device is reset, power down, or another mode change command is received. It is not stored in the EEPROM. Mode byte as follows:

7	6	5	4	3	2	1	0
Ind4	Act4	Ind3	Act3	Ind2	Act2	Ind1	Act1

Act1: Act1 = 1, Port 1 is active and will be polled
Act1 = 0, Port 1 is inactive and won't be polled
Ind1: Ind1 = 1, the encoder on Port 1 is indexed
Ind1 = 0, the encoder on Port 1 is NOT indexed
Act2: Act2 = 1, Port 2 is active and will be polled
Act2 = 0, Port 2 is inactive and won't be polled
Ind2: Ind2 = 1, the encoder on Port 2 is indexed
Ind2 = 0, the encoder on Port 2 is NOT indexed
Act3: Act3 = 1, Port 3 is active and will be polled
Act3 = 0, Port 3 is inactive and won't be polled
Ind3: Ind3 = 1, the encoder on Port 3 is indexed
Ind3 = 0, the encoder on Port 3 is NOT indexed
Act4: Act4 = 1, Port 4 is active and will be polled
Act4 = 0, Port 4 is inactive and won't be polled
Ind4: Ind4 = 1, the encoder on Port 4 is indexed
Ind4 = 0, the encoder on Port 4 is NOT indexed

Note: The index signal is normally low. If a port is "indexed" and the index signal is true then that encoder's counter will be reset.

Reset Command:
2 bytes: request byte, 0E
Returns checksum if command is successful.
After releasing the busy line the device does a software reset (the baud rate returns to 9600 after the checksum byte is sent). The device requires 35msec after reset to be ready to receive new commands. The other ways to reset are: turning the power off, or sending a break condition (dataL low, dataH high) for at least 1 second. Note that the reset threshold of the power input is between 4.5 and 5.5V. The EEPROM parameters are not affected, but any temporary mode changes or baud rate change are lost.

Change Baud Rate Command (temporary)
3 bytes: request byte, 0F, baud rate byte
Returns checksum if command is successful.
The rate will be changed as follows and will be effective after checksum is sent until the device is reset or another baud rate change command is received. At reset, the baud rate always defaults to 9600.

Note: If multiple devices are on the same bus, use address F to set them all to the same baud rate.

baud rate byte	baud rate
0x00	115200
0x01	57600
0x10	38400
0x11	19200
0x12	9600
0x13	4800
0x14	2400
0x15	1200