7-bit, 8-bit, and 10-bit I2C Slave Addressing

The I2C specification from NXP specifies two different slave addressing schemes. Standard Mode I2C makes use of 7-bit addressing. 10-bit addressing was later added as an extension to standard mode I2C.

7-bit Addressing

In 7-bit addressing procedure, the slave address is transferred in the first byte after the Start condition. The first seven bits of the byte comprise the slave address. The eighth bit is the read/write flag where 0 indicates a write and 1 indicates a read.

Slave Address							R/W
A6	A5	A4	A3	A2	A1	A0	
MSB							LSB

Reserved Addresses

The I2C specification has reserved two sets of eight addresses, 1111XXX and 0000XXX. These addresses are used for special purposes. The following table has been taken from the NXP Semiconductors manual UM10204 also known as I2C-bus specification and user manual - Rev. 5 — 9 October 2012 section 3.1.12 on page 17.

Slave Address	R/W Bit	Description
000 0000	0	General call address
000 0000	1	START byte
000 0001	X	CBUS address
000 0010	X	Reserved for different bus format
000 0011	X	Reserved for future purposes
000 01XX	X	Hs-mode master code
111 10XX	X	10-bit slave addressing
111 11XX	X	Reserved for future purposes

- No device is allowed to acknowledge at the reception of the START byte.
- The CBUS address has been reserved to enable the inter-mixing of CBUS compatible and I2C-bus compatible devices in the same system. I2C-bus compatible devices are not allowed to respond on reception of this address.
- The address reserved for a different bus format is included to enable I2C and other protocols to be mixed. Only I2C-bus compatible devices that can work with such formats and protocols are allowed to respond to this address.

8-bit Addresses

Some vendors provide 8-bit addresses which include the read/write bit. You can determine if this is the case because they will provide one address for writing to the slave device and another to reading from the slave. In these situations use only use the top seven bits of the address.

For example: If the read address is 0x9B and the write address is 0x9A then use only the top seven bits and you get an address of 0x4D.

Another way to see if a vendor is using 8-bit addresses instead of 7-bit addresses is to check the address range. All 7-bit addresses should be in the range of 0x08 to 0x77 (decimal 8 to 119). If your slave address is outside this range then probably your vendor has specified an 8-bit address.

10-bit Addressing

10-bit addressing was designed to be compatible with 7-bit addressing, allowing developers to mix two types of devices on a single bus. When communicating with a 10-bit addressed device, the special reserved address is used to indicate that 10-bit addressing is being used.

	10 bit address indicator							R/W		Slave Address								
	1	1	1	1	0	A9	A8			A7	A6	A5	A4	A3	A2	A1	A0	
START									ACK									ACK

In 10-bit addressing, the slave address is sent in the first two bytes. The first byte begins with the special reserved address of 1111 0XX which indicates that 10-bit addressing is being used. The 10 bits of the address is encoded in the last 2 bits of the first byte and the entire 8 bits of the second byte. The 8th bit of the first byte remains the read/write flag.