Multi Color LED Controller

Master - Slave Communication Protocol

(Revised Version 5.0)

Changes Done:

- **Changed Color Pattern**

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Introduction

In order for the successful communication between master and slave, a protocol must be defined to communicate between the dedicated board.

Communication Protocol

Communication Protocol used for transferring data between master and slave is through I^2C Protocol. As per the schematics of K64F, it has three I^2C.

I2C Name	Address	Pin Out	Headers
I2C0	0x4006_6000	PTD3, PTD4 PTB0, PTB1 **PTB2, PTB3** **PTE24, PTE25**	*No Headers* *No Headers* **J4-2, J4-4** **J2-20, J2-18**
I2C1	0x4006_7000	PTE0, PTE1 **PTC10, PTC11**	*No Headers* **J4-12, J4-10**
I2C2	0x400E_6000	PTA12, PTA13, PTA14	*No Headers*

I^2C PIN	PIN	Header
I2C0 SDL	**PTE24**	**J2-20**
I2C0 SCL	**PTE25**	**J2-18**

Note:
As per the discussion, we have collective understand and agreed to select I^2C0 in FRDM 64, with a base address of 0x4006_6000, which is available in header, J2-20 & J2-18

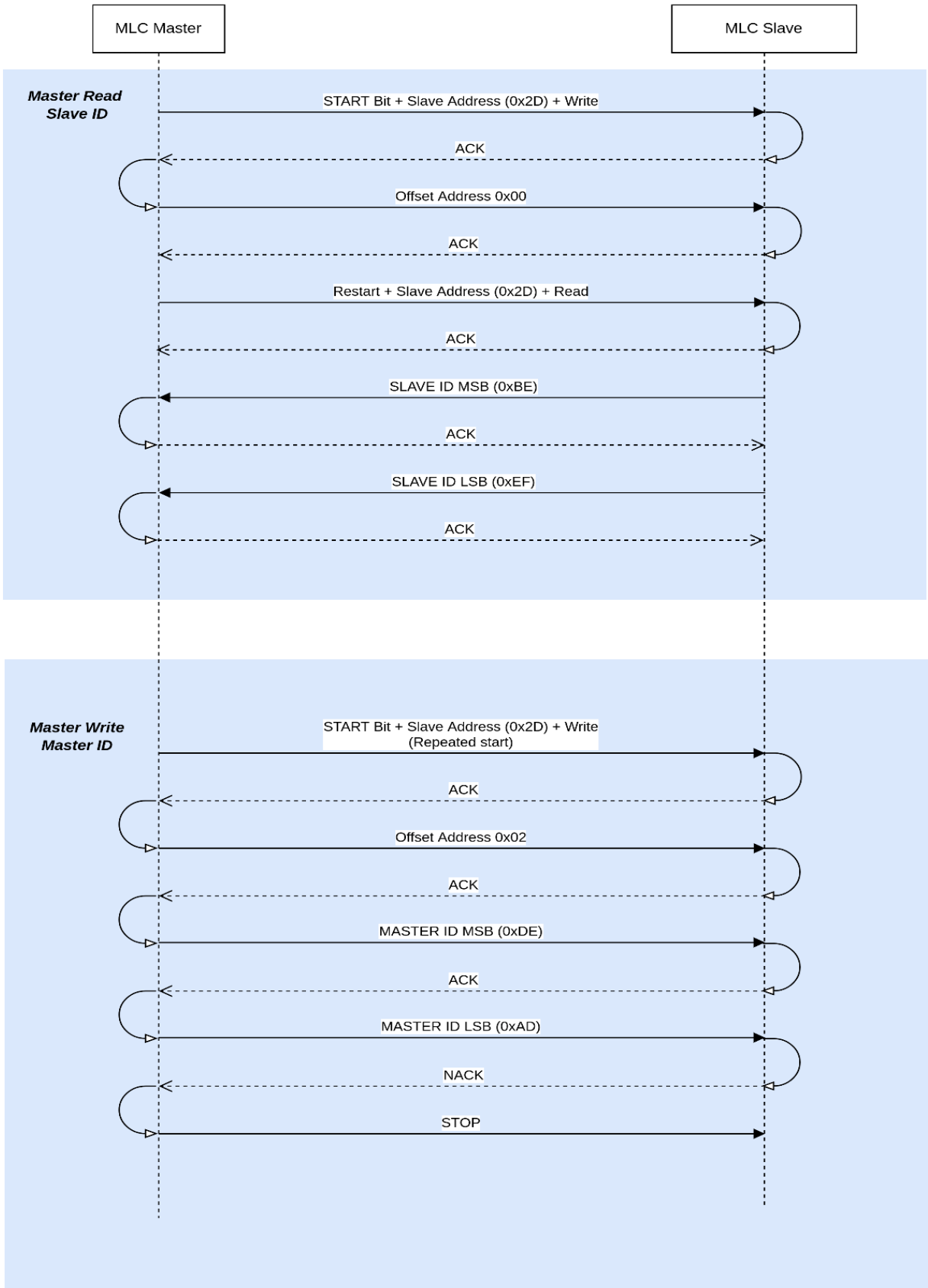
Communication Between Boards

MLC Slave(I^2C Slave) - Memory Offsets

Content	Offset	Size	Value	Description
Slave Mode	0x00	2 Byte	0xBEEF	If the board is detected in Slave mode, the slave will write BEEF in 0x00
Master Write	0x02	2 Byte	0xDEAD	Master will write DEAD to 0x02 to give existence of master
Start Color	0x04	3 Byte		When operating is 8 bit true bit 0x04 -> 8bit RGB START *Remaining 2 Bytes are reserved for future expansion*
End Color	0x07	3 Byte		When operating is 8 bit true bit 0x07 -> 8bit RGB END *Remaining 2 Bytes are reserved for future expansion*
Step Value	0x0A	1 Byte		
Step Mode	0x0B	1 Byte		0x00 - Default 0x01 - Auto UP 0x02 - Auto DOWN 0x03 - Auto UP/DOWN 0x04 - Manual
No. of cycles	0x0C	1 Byte		
Color Change Rate	0x0D	2 Byte		Range 0-500, value will be written in the format MSB + LSB
Refresh Rate	0x0F	2 Byte		Range 1-9999 value will be written in the format MSB + LSB
Color coding scheme	0x10	1 Byte		*For future addition*
Control Mode	0x11	1 Byte		0x00 - Default 0x01 - START 0x02 - STOP 0x03 - PAUSE 0x04 - CONTINUE 0x05 - UP 0x06 - DOWN

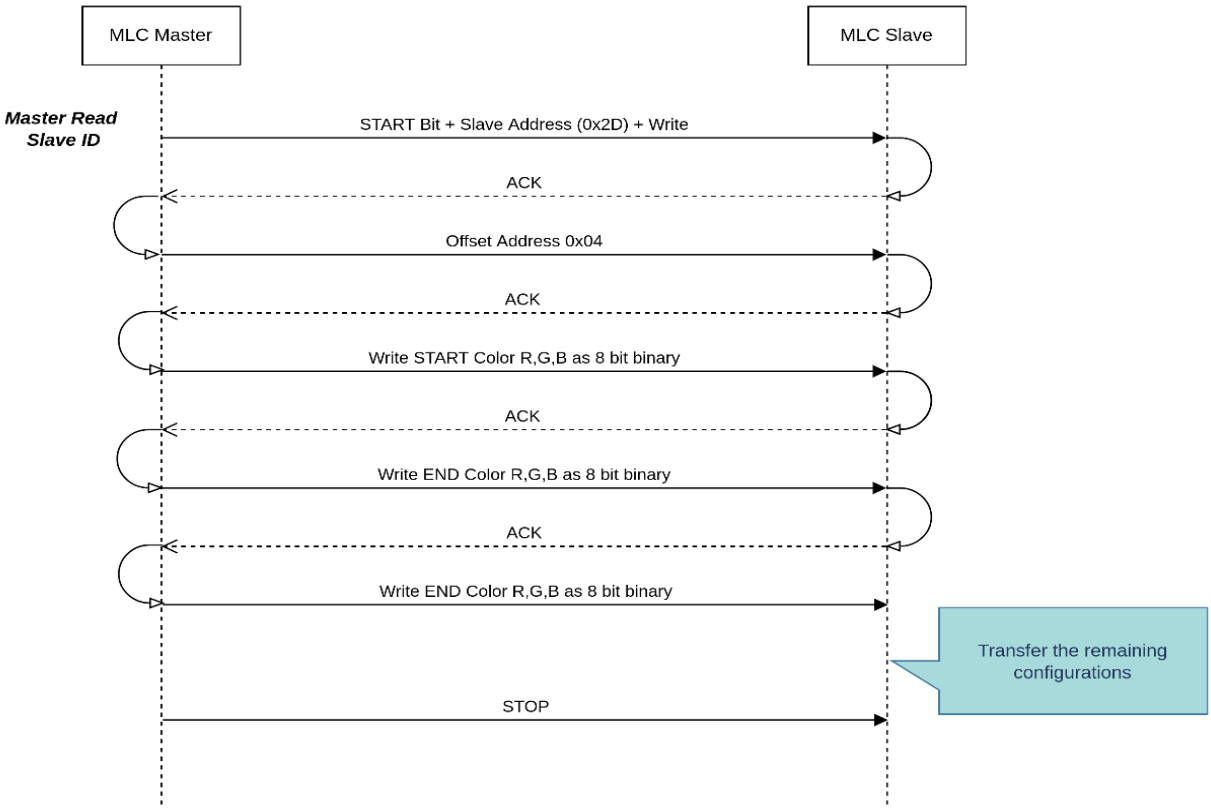
MLC Master - MLC Slave Communication

Hand Shaking



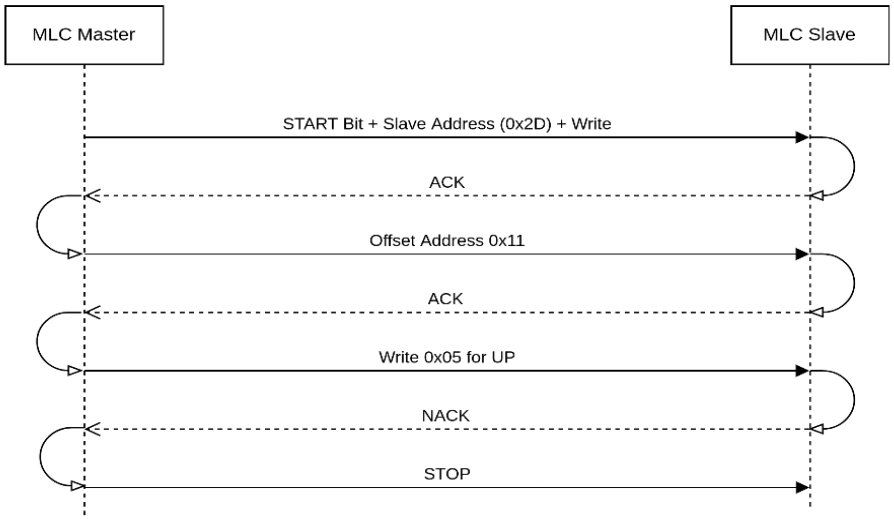
MLC Master - MLC Slave Communication

Transfering Configuration



MLC Master - MLC Slave Communication

Action Key Press (Color Change UP in Manual Mode)



Note:
As per the common discussion, we agreed to set communication as the following protocol.

- Whole configuration from the master will be sent as a structure.
- All action keys, (UP/DOWN) etc will be send to 0x11 offset
- All memory offset corresponding to each configuration are listed above
- Slave Address is **0x2D**

MultiColor LED Controller - Color Pattern

- As per now colors should be entered in R,G,B pattern
- The step value should be also in R_{step},G_{step},B_{step}
- Step Size Range is 0-7 (RED), 0-7 (GREEN), 0-3 (BLUE).
- If $COLOR_{START}$ & $COLOR_{END}$ are same then, $COLOR_{STEP}$ must be **ZERO.** *(COLOR can be RED, BLUE or GREEN)*
- If $COLOR_{START}$ & $COLOR_{END}$ are different then there must be a STEP VALUE greater than **ZERO**.
- If each color is allowed to change with an appropriate step size, then *BLUE* must be changed first then *GREEN* after that *RED. (Detailed Color Pattern is given below)*
- START color must be **always less** than END color.
- After completion of a cycle LED must be paused in END COLOR.

Model Pattern 1

START Color	0,0,0
END Color	7,7,3
Step	1,1,1
Mode	UP

0, 0, 0	1, 0, 0	2, 0, 0	3, 0, 0	4, 0, 0	5, 0, 0	6, 0, 0	7, 0, 0
0, 1, 0	1, 1, 0	2, 1, 0	3, 1, 0	4, 1, 0	5, 1, 0	6, 1, 0	7, 1, 0
0, 2, 0	1, 2, 0	2, 2, 0	3, 2, 0	4, 2, 0	5, 2, 0	6, 2, 0	7, 2, 0
0, 3, 0	1, 3, 0	2, 3, 0	3, 3, 0	4, 3, 0	5, 3, 0	6, 3, 0	7, 3, 0
0, 4, 0	1, 4, 0	2, 4, 0	3, 4, 0	4, 4, 0	5, 4, 0	6, 4, 0	7, 4, 0
0, 5, 0	1, 5, 0	2, 5, 0	3, 5, 0	4, 5, 0	5, 5, 0	6, 5, 0	7, 5, 0
0, 6, 0	1, 6, 0	2, 6, 0	3, 6, 0	4, 6, 0	5, 6, 0	6, 6, 0	7, 6, 0
0, 7, 0	1, 7, 0	2, 7, 0	3, 7, 0	4, 7, 0	5, 7, 0	6, 7, 0	7, 7, 0
0, 0, 1	1, 0, 1	2, 0, 1	3, 0, 1	4, 0, 1	5, 0, 1	6, 0, 1	7, 0, 1
0, 1, 1	1, 1, 1	2, 1, 1	3, 1, 1	4, 1, 1	5, 1, 1	6, 1, 1	7, 1, 1
0, 2, 1	1, 2, 1	2, 2, 1	3, 2, 1	4, 2, 1	5, 2, 1	6, 2, 1	7, 2, 1
0, 3, 1	1, 3, 1	2, 3, 1	3, 3, 1	4, 3, 1	5, 3, 1	6, 3, 1	7, 3, 1
0, 4, 1	1, 4, 1	2, 4, 1	3, 4, 1	4, 4, 1	5, 4, 1	6, 4, 1	7, 4, 1
0, 5, 1	1, 5, 1	2, 5, 1	3, 5, 1	4, 5, 1	5, 5, 1	6, 5, 1	7, 5, 1
0, 6, 1	1, 6, 1	2, 6, 1	3, 6, 1	4, 6, 1	5, 6, 1	6, 6, 1	7, 6, 1
0, 7, 1	1, 7, 1	2, 7, 1	3, 7, 1	4, 7, 1	5, 7, 1	6, 7, 1	7, 7, 1
0, 0, 2	1, 0, 2	2, 0, 2	3, 0, 2	4, 0, 2	5, 0, 2	6, 0, 2	7, 0, 2
0, 1, 2	1, 1, 2	2, 1, 2	3, 1, 2	4, 1, 2	5, 1, 2	6, 1, 2	7, 1, 2
0, 2, 2	1, 2, 2	2, 2, 2	3, 2, 2	4, 2, 2	5, 2, 2	6, 2, 2	7, 2, 2
0, 3, 2	1, 3, 2	2, 3, 2	3, 3, 2	4, 3, 2	5, 3, 2	6, 3, 2	7, 3, 2
0, 4, 2	1, 4, 2	2, 4, 2	3, 4, 2	4, 4, 2	5, 4, 2	6, 4, 2	7, 4, 2
0, 5, 2	1, 5, 2	2, 5, 2	3, 5, 2	4, 5, 2	5, 5, 2	6, 5, 2	7, 5, 2
0, 6, 2	1, 6, 2	2, 6, 2	3, 6, 2	4, 6, 2	5, 6, 2	6, 6, 2	7, 6, 2
0, 7, 2	1, 7, 2	2, 7, 2	3, 7, 2	4, 7, 2	5, 7, 2	6, 7, 2	7, 7, 2
0, 0, 3	1, 0, 3	2, 0, 3	3, 0, 3	4, 0, 3	5, 0, 3	6, 0, 3	7, 0, 3
0, 1, 3	1, 1, 3	2, 1, 3	3, 1, 3	4, 1, 3	5, 1, 3	6, 1, 3	7, 1, 3
0, 2, 3	1, 2, 3	2, 2, 3	3, 2, 3	4, 2, 3	5, 2, 3	6, 2, 3	7, 2, 3
0, 3, 3	1, 3, 3	2, 3, 3	3, 3, 3	4, 3, 3	5, 3, 3	6, 3, 3	7, 3, 3
0, 4, 3	1, 4, 3	2, 4, 3	3, 4, 3	4, 4, 3	5, 4, 3	6, 4, 3	7, 4, 3
0, 5, 3	1, 5, 3	2, 5, 3	3, 5, 3	4, 5, 3	5, 5, 3	6, 5, 3	7, 5, 3
0, 6, 3	1, 6, 3	2, 6, 3	3, 6, 3	4, 6, 3	5, 6, 3	6, 6, 3	7, 6, 3
0, 7, 3	1, 7, 3	2, 7, 3	3, 7, 3	4, 7, 3	5, 7, 3	6, 7, 3	7, 7, 3

Model Pattern 2

START Color	1,5,**2**
END Color	5,7,**2**
Step	2,2,0
Mode	UP

1,5,2	**1,7,2**	**3,5,2**	**3,7,2**	**5,5,2**	**5,7,2**

START Color	1,5,**2**
END Color	5,7,**2**
Step	2,2,0
Mode	**DOWN**

5,7,2	**5,5,2**	**3,7,2**	**3,5,2**	**1,7,2**	**1,5,2**

Note:

Since $START_{BLUE}$ and END_{BLUE} is 2, then the step value of BLUE should be zero