This user guide describes the UART Interface channel setup, protocol details, and supported commans to configure and control the OLED Driver. For additional UART protocol information, refer to BIT-UG 0000: User Guide, Protocol, UART, General.

Underlined command labels indicate user-issued command.

1 Channel Configuration

Baud rate	115.2k
Data bits	8
Stop bits	1
Parity	none
Flow control	none

2 Command Prompt

Indicates when the system is ready to accept a command.

RDY>

3 ChanChar

None

Ref: BIT-UG-0000: User Guide, Protocol, UART, General

4 Command Transactions

In all cases, the OLED Driver is ready to process a UART command following the transmission of the command prompt (**RDY>**). The OLED Driver UART contains a 1KB command buffer so multiple commands may be collected for sequential processing. However, the recommended method for issuing multiple UART commands is to issue them individually waiting for the returned command prompt following a command transmission before transmitting the next command. Response times for the OLED Driver to issue the command prompt may vary depending on the execution time of the most recently transmitted command, however most commands are executed prior to the transmission of the command prompt. Maximum response time is TBD.

4.1 Examples

In each of the following case examples the characters transmitted by the host are underlined. Carriage return [CR] and line feed [LF] characters are not shown.

4.1.1 Unsigned Integer

The host requests a read-back of the pattern selection (PATT):

```
RDY>PATT
    0-PATT    2 [02]
RDY>
```

The response line begins with four space characters, followed by a channel character (“0-“), followed by an echo of the command, followed by a decimal version of the status value, followed by a hexadecimal version of the value in square brackets.

Notes:

1. The channel character will always be zero.
2. The number of spaces between fields is variable.
3. The number of digits in the hexadecimal value is variable.
4. There is no “0x” prefix attached to the hexadecimal value.
5. Following the status read-back line the device will return a new prompt (“RDY>”).

Here the host sets a new pattern value:

```
RDY>PATT 6
RDY>
```

And reads it back as before:

```
RDY>PATT
    0-PATT    6 [06]
RDY>
```

4.1.2 Signed Integer

These communications are the same as for the unsigned case, except that the decimal form of the value can be preceded by a minus sign.

```
RDY>HPOS
    0-HPOS      0 [0000]
RDY>
```

Set HPOS to negative 2:

```
RDY>HPOS -2
RDY>
```

In the following sequence the host reads back the current HPOS value, sets a new value of (positive) 5, and then reads back the new setting:

```
RDY>HPOS
    0-HPOS     -2 [fffffffe]
RDY>HPOS 5
RDY>HPOS
    0-HPOS      5 [0005]
RDY>
```

4.1.3 Floating Point (f-p)

In this case the value returned will contain a decimal point:

```
RDY>OTEMP
    0-OTEMP    61.521 [42761568]
RDY>
```

Note that negative floating point values are also supported.

4.1.4 Error

Error responses are typically appended to the command line that caused the error:

```
RDY>XYZ -- ERROR: CommandUnsupported
RDY>
```

The label “ERROR:” is always preceded by a space-hyphen-hyphen-space sequence.

The text following the “ERROR:” label is generally descriptive of the problem, and the string will contain no spaces or punctuation.

5 Command Table

			Argument (all numerical values in decimal)						Description	
Label	access	Index	min	Factory Default[1]	max	Type	unit	Auto-Save	Class	Function
BRT	r/w	n/a	0	**BRTMOD/2**	BRTMOD	unsigned int	n/a	Yes	Image Control	Set brightness (luminance)
BRTMOD	r/w	n/a	4	**16**	32	unsigned int	n/a	Yes	Image Control	Set number of BRT adjustment steps (modulus)
BRTINC	w	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Image Control	Increment BRT by 1
BRTDEC	w	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Image Control	Decrement BRT by 1
MAXLUM	r/w	n/a	10	**100**	100	unsigned int	%	Yes	Image Control	Set maximum display luminance, 100% = display device upper limit
GAMMA	r/w	n/a	1.0	**1.8**	2.2	f-p	exp	Yes	Image control	Set display gamma value Supported values: 1.0, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2
COLOR	r/w	n/a	0	**1**	1	unsigned int	n/a	Yes	Image Control	Set color mode: 0 = monochrome: SMPTE summed RGB => RGB 1 = full color: RGB => RGB
VIDINV	r/w	n/a	0	**0**	1	unsigned int	n/a	Yes	Image Control	Set video inversion mode 0 = normal, 1 = video inverted (B <=> W)
HPOS	r/w	n/a	-6	**0**	+6	signed int	column	Yes	Image Control	Set horizontal image position offset 0 = default center neutral
VPOS	r/w	n/a	-6	**0**	+6	signed int	row	Yes	Image Control	Set vertical image position offset 0 = default center neutral
HSCAN	r/w	n/a	0	**0**	1	unsigned int	n/a	Yes	Image Control	Set horizontal image scan direction 0 = normal L → R, 1 = reversed R → L
VSCAN	r/w	n/a	0	**0**	1	unsigned int	n/a	Yes	Image Control	Set vertical image scan direction 0 = normal T → B, 1 = reversed B → T
IVQ	r	n/a	n/a	n/a	n/a	n/a	ref para 7.1.4	n/a	System	Query input video returns lock status, vert & horiz resolution & frequencies
POWER	r/w	n/a	0	**1**	1	unsigned int	n/a	Yes	System	Set power mode 0 = powered-down (low-power) 1 = operational
DPDC	r/w	n/a	1	**100**	100	unsigned int	%	Yes	Image Control	Set frame duty-cycle (100% = no row blanking)
OTEMP	r	n/a	n/a	n/a	n/a	signed f-p	°C	n/a	System	Query OLED Temperature
PATT	r/w	n/a	0	**0**	6	unsigned int	n/a	No	Image Control	Set OLED Driver Test Pattern 0 = No pattern 1 = Lines (W on B) 2 = Color Bars 100% 3 = Color Bars 75% 4 = Gray scale (L => R: B => W) 5 = Gray scale (L => R: W => B) 6 = Gray ramp (L => R: B => W)
LEDEN	r/w	n/a	0	**1**	1	unsigned int	n/a	Yes	System	Set LED enable: 0 = BLU, RED LEDs disabled 1 = BLU, RED LEDs enabled
WBCR	r/w	n/a	0	**255**	255	unsigned int	n/a	Yes	Image Control	Set Red channel pixel gain: 0 = 0% 255 = 100%
WBCG	r/w	n/a	0	**255**	255	unsigned int	n/a	Yes	Image Control	Set Green channel pixel gain: 0 = 0% 255 = 100%
WBCB	r/w	n/a	0	**255**	255	unsigned int	n/a	Yes	Image Control	Set Blue channel pixel gain: 0 = 0% 255 = 100%
OGAMTRIM	r/w	0~6	-1023	**All = 0**	1023 (limited)	signed int	m/a	Yes		Adjust gamma at pixel values of: 2, 4, 8, 16, 32, 64, 128
OVCKDUTY	r/w	n/a	0	**0**	6	unsigned int	n/a	Yes		Adjust OLED VCOM clock duty cycle 0=1:7, 1=1:3, 2=3:5, 3=1:1, 4=5:3, 5=3:1, 6=7:1

(1) Factory Default values overwritten upon change by auto-save function.

6 Detailed Command Descriptions

BRT

Sets OLED image brightness level (luminance) in unit increments from 0 (min) to **BRTMOD** value (max).

BRTMOD

Sets the number of BRT steps over luminance range.
Example:

BRTMOD = 16
BRT steps = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, **16**

BRTINC

Increments **BRT** value by 1. If **BRT** = **BRTMOD**, no operation.

BRTDEC

Decrements **BRT** value by 1. If **BRT** = 0, no operation.

MAXLUM

Sets luminance value for **BRT** = **BRTMOD** as a percentage of maximum OLED luminance.

GAMMA

Sets display gamma value.

COLOR

Sets display color mode.

COLOR = 0 Monochrome display (B/W: SMPTE summed RGB)
COLOR = 1 Color display

VIDINV

Sets poalrity mode.

VIDINV = 0 Normal video polarity
VIDINV = 1 Inverted video polarity (reverse-contrast)

HPOS

Sets horizontal image position.
Negative values move image to the left, positive values move image to the right.
Unit = 1 column

VPOS

Sets vertical image position.
Negative values move image up, positive values move image down.
Unit = 1 row

HSCAN

Sets horizontal scan direction.

HSCAN = 0 normal horizontal scan direction (L → R)
HSCAN = 1 reverse horizontal scan direction (L ← R)

Normal scan orientation specified in product datasheet.

VSCAN

Sets vertical scan direction.

VSCAN = 0 normal vertical scan direction (T → B)
VSCAN = 1 reverse vertical scan direction (T ← B)

Normal scan direction specified in product datasheet.

IVQ

Queries input video.
The response to an IVQ query has a unique format, unlike standard commands and responses:

```
RDY>IVQ
RDY> 1280 x 1024 108.0MHz Locked
RDY>
```

Note that the response line in this case starts with a prompt plus a space rather than four spaces.
Should no valid data be available then IVQ will substitute zeros:

```
RDY>IVQ
RDY> 0 x 0 0.0MHz Unlocked
RDY>
```

POWER

Sets power mode.
Consists of 2 bits, the LSB (control) is read/write while the MSB (status) is read only. These are defined as follows:

POWER[0] - Control writing a 0 or 1 to this bit sets the power mode of the OLED Driver
POWER[1] - Status this bit indicates the status of the transition from one power state to the other:

0 indicates transition complete / steady-state
1 indicates transition in progress

Read-back **POWER**[1:0] values:

0 indicates OLED Driver is in powered-down state
1 indicates OLED Driver is in operational state
2 indicates OLED Driver is transitioning to powered-down state
3 indicates OLED Driver is transitioning to operational state

DPDC

Sets Display PWM Duty Cycle.

OTEMP

Reads OLED temperature.

PATT

Sets bult-in test pattern.

PATT = 0 No pattern selected, input video displayed
1 Lines pattern
2 Color Bars (100%)
3 Color Bars (75%)
4 Gray Scale (L → R / B → W)
5 Gray Scale (L → R / W → B)
6 Gray Ramp (L → R / B → W)

LEDEN

Sets **ACT**, **OOL** indicator LED mode.

LEDEN = 0 LEDs disabled
1 LEDs enabled

WBCx

Sets R/G/B channel gain values of White Balance Control.

x = R, G, B

The White Balance Control (**WBC**) function provides a method for adjusting the R-G-B mix of video data applied to the OLED to establish a desired white chromaticity value by attenuating excessively strong color component(s). The applied R/G/B color pixel values are as follows:

$RED_{applied}$ = RED_{in} * (**WBCR**/255)
$GRN_{applied}$ = GRN_{in} * (**WBCG**/255)
$BLU_{applied}$ = BLU_{in} * (**WBCB**/255)

OGAMTRIM

The Gamma Trim (**OGAMTRIM**) function provides a method for adjusting the automatically calculated gamma at the following input pixel values:

Index (n)	Pixel Value
0	2
1	4
2	8
3	16
4	32
5	64
6	128

The **OGAMTRIM** command can be used to either increase or decrease the gamma response at the corresponding indexed input pixel value. Input values are automatically limited to maintain gamma-converted pixel values between 0 and 1023. The format of the OGAMTRIM command is shown below where n – index (0~6) and x = trim value (-1023~1023):

```
RDY>OGAMTRIM n x
RDY>
```

OVCKDUTY

The **OVCKDUTY** command provides a method for adjusting the OLED VCOM clock duty cycle which may reduce on-screen noise under certain image-content and viewing conditions.

Contact

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