Application Note

CPOL3 - QR Code Format Specification

Author
Josef Schmidbauer | josef.schmidbauer@omicronenergy.com

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CPOL3

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Abstract

This document describes the QR code format used to export measurement data from CPOL3.

General information

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OMICRON translates this Application Note from the source language English into a number of other languages. Any translation of this document is undertaken for local requirements, and in the event of a dispute between the English and a non-English version, the English version of this note shall govern.

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1   Introduction

CPOL3 allows to export measurement data via a QR code. This code can be scanned with customer specific or third-party applications to get the measurement data as digital values for documentation.

Two different export types are supported and can be selected in the Settings Menu:

Text   Export the measurement data as one line ASCII string with semicolons as field separator.

JSON   Export the measurement data as JSON data with additional meta information.

The second format also includes an ASCII string which can be used to reconstruct the screen content in Oscilloscope of Spectrum mode for documentation purposes.

2 QR Code Text Format

The QR Code Text Format generates one ASCII line per measurement (= per QR Code), using a semicolon as field separator. Some cell phones allow to store the parsed QR code content in the integrated text editor. This text can be exported and e.g., imported in a spreadsheet application.

The QR Code Text Format is available in the following modes:

Mode	Description
Meter	Contains the meter value and the detected polarity
Oscilloscope	Contains the RMS value (no polarity information available)
Spectrum	Contains the RMS value and optional the detected dominant frequency and the according amplitude (no polarity information available)

Format:

`[Value]; [Unit]; [Type]; [Polarity]; [Factor]; [LoZ]; [Freq] ; [Amp]`

Example:

`12.324; "V"; "RMS"; -3; 10; 0`

Example:

Name	Type	Content	Comment	Example
Value	Float	Measured value		`12.324`
Unit	String	`"V"` or `"A"`		`"V"`
Type	String	`"RMS"` or `"DC"`		`"RMS"`
Polarity	Integer	Detected CPOL Polarity (Only in meter mode) +/- for correct/wrong polarity 0...No CPOL signal found 1...CPOL signal found 2...CPOL signal + Phase ID 1 3...CPOL signal + Phase ID 2		`-3`

		4…CPOL signal + Phase ID 3 5…CPOL signal + Phase ID 4		
Factor	Integer	Conversion Factor used in „A" mode 1 1 A/V 1 V/A 10 10 A/V 100 mV/A 100 100 A/V 10 mV/A 1000 1000 A/V 1 mV/A		**10**
LoZ	Bool	LoZ mode: 0 Disabled 1 Enabled		**0**
Freq	Float	Dominant frequency in Hz (Only in spectrum mode, if sufficiently large)	Optional	**50.021**
Amp	Float	Amplitude of dominant frequency in V or A. (Only in spectrum mode, if sufficiently large) Note: only limited accuracy	Optional	**2.3143**

Please refer to the CPOL3 user manual [1] for measurement accuracy.

3 QR Code JSON Format

The QR Code JSON Format contains more information than the Text Format. If can be used in customer specific applications or third-party solutions to parse and document the results of CPOL3 measurements.

A parser need to check if there is a „dev"-section in the JSON Format with an „id" attribute. If the value of this attribute is „CPOL3", it should check the value of the „ver"-attribute. If it has a value of 0, the format described in this specification can be assumed.

Otherwise, it should display a message that the JSON format is not supported.

3.1 Meter Mode

JSON Format:

Example:

```
{
    "dev":{
        "id":"CPOL3",
        "sw":"1.0.4",
        "ver":0
    },
    "conf":{
        "ampconv":10,
        "loZ":0
    },
    "reading":{
        "rms":12.324,
        "dc":0.0031,
        "cpol":-3,
        "unit":"A"
    }
}
```

Example:

Name	Type	Content	Example
Version	String	Software version	`"1.0.4"`
JSONVersion	Integer	JSON format version, currently always 0	`0`
Factor	String	Conversion Factor used in „A" mode "1" 1 A/V 1 V/A "10" 10 A/V 100 mV/A "100" 100 A/V 10 mV/A "1000" 1000 A/V 1 mV/A	`"10"`
LoZ	Bool	LoZ mode: 0 Disabled 1 Enabled	`0`
RMSValue	Float	Measured RMS value	`12.324`
DCValue	Float	Measured DC value	`0.0031`
Polarity	Integer	Detected CPOL Polarity (Only in meter mode) +/- for correct/wrong polarity 0…No CPOL signal found 1…CPOL signal found 2…CPOL signal + Phase ID 1 3…CPOL signal + Phase ID 2 4…CPOL signal + Phase ID 3 5…CPOL signal + Phase ID 4	`−3`
Unit	String	`"V"` or `"A"`	`"A"`

3.2 Oscilloscope and Spectrum Mode

In Oscilloscope and Spectrum mode, the measured RMS value will be exported in the JSON String.
Additionally, a base 64 encoded string will be exported which can be used to reconstruct the screen content
(with limited accuracy).

Format:

```
{
     "dev":{
          "id":"CPOL3",
          "sw":[Version],
          "ver":0
     },
     "conf":{
          "ampconv":[Factor],
          "loZ":[LoZ]
     },
     [Mode]:{
          "data":[PlotData],
          "xdiv":[XDiv],
          "ydiv":[YDiv],
          "unit":[Unit]
     }
     "reading":{
          "rms":[RMSValue],
          "unit":[Unit]
     }
}
```

Example:

```
{
     "dev":{
          "id":"CPOL3",
          "sw":"1.0.4",
          "ver":0
     },
     "conf":{
          "ampconv":10,
          "loZ":0
     },
     "scope":{
          "data":"wyz0zxxxxxwvut……XWUTRSSTSQOMKJJJ",
          "xdiv":0.0002,
          "ydiv":35.714,
          "unit":"V"
     },
     "reading":{
          "rms":0.4912,
          "unit":"V"
     }
}
```

Name	Type	Content	Example
Version	String	Software version	`"1.0.4"`
JSONVersion	Integer	JSON format version, currently always 0	`0`
Factor	String	Conversion Factor used in `"A"` mode: `"1"` 1 A/V 1 V/A `"10"` 10 A/V 100 mV/A `"100"` 100 A/V 10 mV/A `"1000"` 1000 A/V 1 mV/A	`"10"`
LoZ	Bool	LoZ mode: 0 Disabled 1 Enabled	`0`
Mode	String	Depending on the used mode either: "scope" for Oscilloscope or "spectrum" for Spectrum.	`"scope"`
PlotData	String	String one character per entry on the y-Axis of the recorded image. (See following chapter)	`"wyz…"`
XDiv	Float	<u>In Oscilloscope mode:</u> Time per entry in PlotData in Second (10 entries are one division, so e.g. 0.0002 s/entry equals 0.002s/div) <u>In Spectrum mode:</u> Frequency per entry in PlotData in Hz (10 entries are on division, so e.g. 1 Hz/entry equals 10 Hz/Div).	`0.0002`
YDiv	Float	Amplitude scaling factor for the entries in PlotData in milli/Unit. (See following chapter)	`35.714`
RMSValue	Float	Measured RMS value	`12.324`
Unit	String	`"V"` or `"A"`	`"A"`

3.3 Interpretation of PlotData

The PlotData String contains one character per entry (pixel) on the x-axis. Each character/entry equals the time or frequency value specified as XDiv factor in the JSON data.

Each character has a specific value, which is multiplied with the YDiv factor in the JSON data.

Character	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Value	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Character	Q	R	S	T	U	V	W	X	Y	Z	a	b	c	d	e	f
Value	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Character	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	V
Value	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Character	w	x	y	z	0	1	2	3	4	5	6	7	8	9	+	/
Value	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63

3.3.1 Oscilloscope Mode

Formula:

$$y(x) = (Value(Character(x)) - 31) * YDiv / 1000.0$$

Code example:

```
function parsePlotDataScope(json) {
    var charArray = "ABCDEFGHIJKLMNOPQRSTUVWXYZ" +
                    "abcdefghijklmnopqrstuvwxyz"+
                    "0123456789+/";
    var parsedValues = [];
    var arr = json['scope']['data'];
    var ydiv = json['scope']['ydiv'];
    for (var i = 0; i < arr.length; i++) {
        var char = arr.charAt(i);
        var value = (charArray.indexOf(char) - 31.0) * ydiv / 1000.0;
        parsedValues.push(value);
    }
    return parsedValues;
}
```

3.3.2 Spectrum Mode

<u>Formula:</u>

$$y(x) = Value(Character(x)) * YDiv / 1000.0$$

<u>Code example:</u>

```
function parsePlotDataScope(json) {
    var charArray = "ABCDEFGHIJKLMNOPQRSTUVWXYZ" +
            "abcdefghijklmnopqrstuvwxyz"+
            "0123456789+/";
    var parsedValues = [];
    var arr = json['spectrum']['data'];
    var ydiv = json['spectrum']['ydiv'];
    for (var i = 0; i < arr.length; i++) {
        var char = arr.charAt(i);
        var value = charArray.indexOf(char) * ydiv / 1000.0;
        parsedValues.push(value);
    }
    return parsedValues;
}
```

3.4 Limitations

- QR Code may cause parsing problems with cell phone cams, caused by interferences between display and camera refresh cycles. Try it in different light situations, select another cell phone camera (e.g. zoom camera) or use another cell phone.
- Export resolution is usually smaller than displayed resolution due to QR code size restrictions.
- Export of voltage/current graphs only supported up to 100 V / 100 A.

4   List of literature

[1]   CPOL3 User Manual, ENU 1269 05 01

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