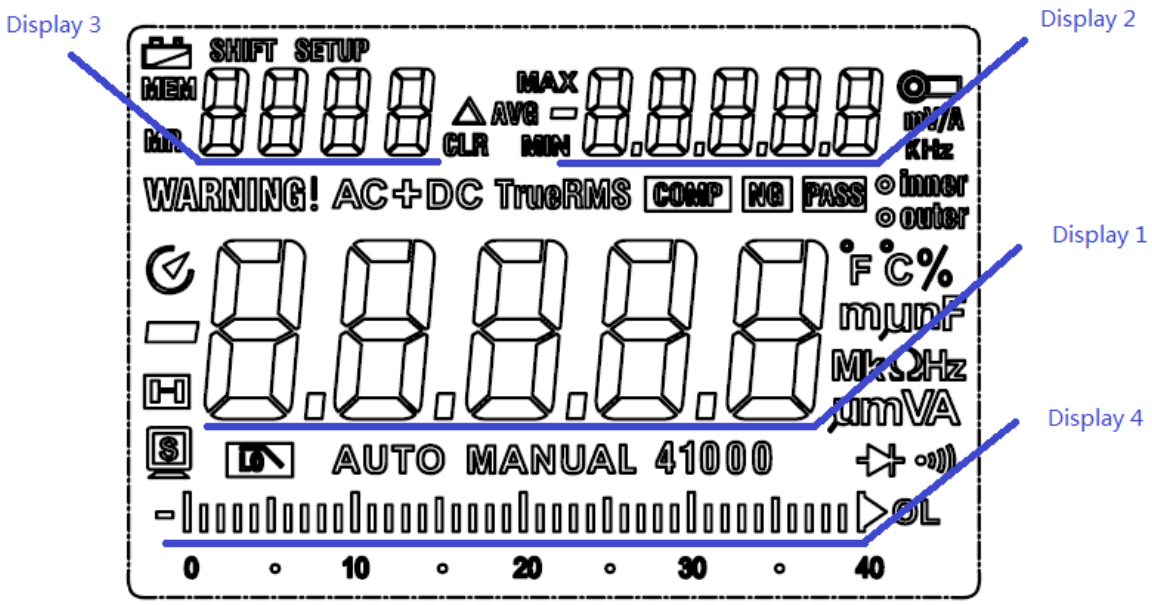
VC880 Protocol Rev 2.4

1. RS-232 Serial Interface Setting

Baud rate is 9600 bits
No parity
1 start bit
8 data bits (LSB first)
1 stop bit

2. LCD Display

Figure below is the screen print of the LCD display of the VC880 device. Please identify the location of the display that will be described in the following document.



3. Message from DMM to PC

The general format of the message sent from the DMM to the PC is represented as in the following:

Header	Length	Msg Type	Payload	Check Sum
2 Byte	1 Byte	1 Byte	TBD	2 Byte

Header:
Header is a two byte value indicating the beginning of the message. For VC880, the message header is always 0xABCD regardless of the message type.

Length:
This value represents the length of the message that has to be handled. It is the number of bytes from ***Msg Type to the last type of Check Sum.***

Msg Type:
This value represents the type of message from the DMM to the PC, where there are 6 types of messages used for the VC880 device, shown as the following table.

Msg Type	Value	Description
Device ID	0x00	The payload of this message contains the Device ID of the DMM
Live Data	0x01	The payload of this message contains the live of the DMM
Comp Data	0x02	The payload of this message contains the comparison mode setting of the DMM
NOCOMP Data Transfer	0x03	The payload of this message contains the NOCOMP data that are saved on the memory
COMP Data Transfer	0x04	The payload of this message contains the COMP data that are saved on the memory
Result	0xFF	The payload of this message contains the result of the data transmission for handshaking purpose.

CheckSum:
16-bits check sum are added after the payload of the message. It is the sum of the byte values from the ***first byte of Header to the last byte of Payload.***

3.1 Device ID

For the Device ID message, the payload of the message contains the identity number of the DMM on the 20 byte value. The Device ID is decoded on the PC with ASIC-II character string.

Header	Length	Msg Type	Device ID	Check Sum
2 Byte	1 Byte	1 Byte	20 Byte	2 Byte
Msg[0]- Msg[1]	Msg[2]	Msg[3]	Msg[4]-Msg[23]	Msg[24]-Msg[25]

3.2 Live Data

For the Live Data message, the payload of the message contain the corresponding values with the current measurement mode of the DMM, where it can be separated into DMM Function, Display 1, Display 2, Display 3, Display 4 and Status. The message format is shown as in the following table.

Header	Length	Msg Type	DMM Function	Display 1	Display2	Display 3	Display 4	Status	Check Sum
2 Byte	1 Byte	1 Byte	2 Byte	7 Byte	7 Byte	7 Byte	3 Byte	7 Byte	2 Byte
Msg[0]-Msg[1]	Msg[2]	Msg[3]	Msg[4]-Msg[5]	Msg[6]-Msg[12]	Msg[13]-Msg[19]	Msg[20]-Msg[26]	Msg[27]-Msg[29]	Msg[30]-Msg[36]	Msg[37]-Msg[38]

DMM Function: Msg[4] – Msg[5]

Two byte is used to represent the selected measurement mode (Msg[4]) and the measurement range (Msg[5]) of the DMM. All the available measurement mode of the VC880 DMM is listed at the following:

Value (HEX)	Measurement Mode
0x00	DCV
0x01	AC+DC
0x02	DCmV
0x03	Frequency
0x04	Duty Cycle
0x05	ACV
0x06	Resistance
0x07	Diode
0x08	Short-Circuit Test
0x09	Capacitance
0x0A	Celsius
0x0B	Fahrenheit
0x0C	DCuA
0x0D	ACuA
0x0E	DCmA
0x0F	ACmA
0x10	DCA
0x11	ACA
0x12	Low-Pass Filter

The DMM range can be decode at the HEX value at Msg[5], this single byte vale represents the select range of operation at different measurement mode.

Value	DCV	ACV	DCmV	OHM	CAP	DCuA	DCmA	DCA	ACuA	ACmA	ACA	FREQ
0x30	4V	4V	400mV	400Ω	40nF	400uA	40mA	10A	400uA	40mA	10A	40Hz

0x31	40V	40V		4KΩ	400 nF	4000uA	400mA		4000uA	400mA		400Hz
0x32	400V	400V		40KΩ	4000 nF							4kHz
0x33	1000V	1000V		400KΩ	40uF							40kHz
0x34				4MΩ	400μF							400kHz
0x35				40MΩ	4000μF							4MHz
0x36					40mF							40MHz
0x37												400MHz

Display 1: Msg[6] – Msg[12]

7 bytes are used to represent the value shown on the Display 1 of the VC880 device. Please decode this value at ASIC-II string on the PC application.

Display 2: Msg[13] – Msg[19]

7 bytes are used to represent the value shown on the Display 2 of the VC880 device. Please decode this value at ASIC-II string on the PC application.

Display 3: Msg[20] – Msg[26]

7 bytes are used to represent the value shown on the Display 3 of the VC880 device. Please decode this value at ASIC-II string on the PC application.

Display 4: Msg[27] – Msg[29]

Three bytes are used to represent the value shown on the Display 4 (Analog Graphic Bar). Please decode this value at ASIC-II string on the PC application.

Status: Msg[30] – Msg[36]

The status of the DMM is stored at 7 different bytes of the live data message.

Msg[30]

0	0	1	1	Sign2_flag	Sign1_flag	COMP_ Min_flag	COMP_ Max_flag

Sign1_flag:

This bit represents the sign bit of the DISP1, 0 means positive value, 1 means negative value;

Sign2_flag:

This bit represents the sign bit of the DISP2, 0 means positive value, 1 means negative value;

Msg[31]

0	0	1	1	Max_flag	Min_flag	Avg_flag	Rel_flag

Max_flag:

When MAX function is on, this bit becomes 1 and the current transmitted data at DISP2 is the maximum value at this range.

Min_flag:

When MIN function is on, this bit becomes 1 and the current transmitted data at DISP2 is the minimum value at this range.

Avg_flag:

When AVG function is on, this bit becomes 1 and the current transmitted data at DISP2 is the average value at this

range.

Rel_flag:

When REL function is on, this bit becomes 1, and the current transmitted data at DISP2 is the relative value.

Msg[32]

0	0	1	1	Ol2_flag	Ol1_flag	Manu_flag	Hold_flag

Ol1_flag:

This bit becomes 1 if the value at DISP1 is overload.

Ol2_flag:

This bit become 1 if the value at DISP2 is overload

Manu_flag:

This bit indicates that Manual/Auto range selection. This bit becomes 1 at manual range, and this bit become 0 at auto range mode.

Hold_flag:

This bit represents the status of the HOLD function. This bit becomes 1 if the hold function is on.

Msg[33]

0	0	1	1	Low_batt_flag	light_flag	Warning_flag	Auto_power_flag

Low_batt_flag:

This bit represents the battery status. This bit becomes 1 when low voltage status is on.

Warning_flag:

This bit represents the super high voltage measurement warning. This bit becomes 1 if super high voltage measurement is active.

Auto_power_flag:

This bite represents the auto power off status of the DMM.

Msg[34]

0	0	1	1	Misplug_warn_flag	Comp_flag	Pass_flag	Inner_flag

Misplug_warn_flag:

This bit represents the mis-plug warning status on the DMM. This bit becomes 1 if warning is active.

Comp_flag:

This bit represents that the comparison mode is on or not, 1 indicate that the comparison mode is on otherwise 0.

Inner_flag:

Comparison mode selection: 0: Inner 1: Outer

Pass_flag:

Comparison mode result: 0: No Good 1: Pass

Msg[35]

0	0	1	1	Shift_flag	Clr_flag	Bar_pol_flag	Mem_flag

Shift_flag:

This bit represents the status of the shift function. 1: shift is active otherwise 0.

Clr_flag：

This bit represents the status of the clear memory function. 1: memory clear otherwise 0.

Bar_pol_flag:

This bit represents the overload status of the Simulate strip number.

mem_flag：

This bit represents the continuous memory function is on or not.

Msg[36]

0	0	ng_beep_enable	pass_beep_enable	Bar_disp_en_flag	Bar_ol_flag	Setup_flag	Double_disp_en_flag

Bar_disp_en_flag:

This bit represents the Simulate strip number is being used at the current test mode. This bit becomes 1 if the Simulate strip number is being used otherwise 0.

Bar_ol_flag:

No use at the current revision.

Setup_flag:

This bit represents the setup button is pressed or not.

Double_disp_en_flag:

This bit represents the DISP2 is being used at the current test mode. This bit becomes 1 if the DISP2 is being used otherwise 0.

3.3 Comp Data

For the Comp Data message, the payload of the message contain MAX MIN COMP value of the stored at the DMM The message format is shown as in the following table. The value of MAX and MIN are represented in ASIC-II format. The value at Inner/Outer mode is 0x00 at Inner Mode, and is 0x01 at Outer Mode. The value at DMM Function is the same as the live data message.

Header	Length	Msg Type	DMM Function	MAX	MIN	Inner/Outer Mode	Check Sum
2 Byte	1 Byte	1 Byte	2 Byte	7 Byte	7 Byte	1 Byte	2 Byte
Msg[0]-Msg[1]	Msg[2]	Msg[3]	Msg[4]-Msg[5]	Msg[6]-Msg[12]	Msg[13]-Msg[19]	Msg[20]	Msg[21]-Msg[22]

3.4 NOCOMP Data Transfer

Once the NOCOMP data transfer mode is enabled, the NOCOMP data stored at the DMM will be transfer from the DMM to PC at the following message format. The value at DMM Function is the same as the live data message.

Header	Length	Msg Type	DMM Function	NoComp Data	Check Sum
2 Byte	1 Byte	1 Byte	2 Byte	7 Byte	2 Byte
Msg[0]-Msg[1]	Msg[2]	Msg[3]	Msg[4]-Msg[5]	Msg[6]-Msg[12]	Msg[13]-Msg[14]

3.5 COMP Data Transfer

Once the COMP data transfer mode is enabled, the COMP data stored at the DMM will be transferred from the DMM to

PC at the following message format. The value at DMM Function is the same as the Live Data message.

Header	Length	Msg Type	DMM Function	Comp Data	MAX	MIN	Inner/Outer Mode	Check Sum
2 Byte	1 Byte	1 Byte	2 Byte	7 Byte	7 Byte	7 Byte	1 Byte	2 Byte
Msg[0]- Msg[1]	Msg[2]	Msg[3]	Msg[4]- Msg[5]	Msg[6]- Msg[12]	Msg[13]- Msg[19]	Msg[20] - Msg[26]	Msg[27]	Msg[28]- Msg[29]

3.6 Result

This message indicates the data transmission result of the message that required handshaking for guarantee of successful data exchange between PC and DMM.

Header	Length	Msg Type	Result	Check Sum
2 Byte	1 Byte	1 Byte	1 Byte	2 Byte
Msg[0]- Msg[1]	Msg[2]	Msg[3]	Msg[4]	Msg[5]-Msg[6]

The result byte has the following value:
0x00 “Successful”
0x01 “Error-Resend-Previous-Message”
0x02 “Error-Do-Nothing”

4. Command from PC to DMM

The general format for command message from the PC to DMM is shown in the following format:

Header	Length	Command	Data	Check Sum
2 Byte	1 Byte	1 Byte	TBD	2 Byte

Header:
Header is a two byte value indicating the beginning of the message. For VC880, 0xABCD is used.

Length:
The length of the message to be handled, it is the number of byte from Command to Check Sum.

Sequence Number:
Sequence Number will increment by 1 for every message.

Command:
Command is the command that send from the PC application to the DMM. The length of the command is depending on the command type that sent. Command may include data to change the setting of the DMM.

Data
Data contain setting information to the DMM from the associated command.

The list of command for VC880 device is shown in the following table：

Decimal	Hex	Command	Data
70	0x46	Manual Range	No
71	0x47	Auto Range	No
72	0x48	REL	No
73	0x49	Max /Min/AVG	No
74	0x4A	Hold	No
75	0x4B	Light	No
76	0x4C	Select	No
77	0x4D	COMP	No
78	0x4E	Single Log	No
65	0x41	Continue Log	No
66	0x42	Load Log Comp_Data	No
67	0x43	Exit MAX/MIN/AVG	No
68	0x44	Load Log NoComp_Data	No
69	0x45	CLR(no comp)	No
79	0x4F	CLR(comp）	No
80	0x50	SET_COMP_ENTER	No
81	0x51	SET_COMP_MODE_HIGH_VALUE	Yes
82	0x52	SET_COMP_MODE_LOW_VALUE	Yes
83	0x53	SET_COMP_MODE_INNER	No
84	0x54	SET_COMP_MODE_OUTER	No
85	0x55	SET_COMP_ESC	No
86	0x56	Load log NoComp Data ESC	No
87	0x57	Load log Comp Data ESC	No
90	0x5A	USB Off	No
91	0x5B	PASS BEEP ENABLE	No
92	0x5C	NG BEEP ENABLE	No
00	0x00	Get Device ID	No
01	0x01	SET_COMP_MODE_ALL	Yes
02	0X02	Comp Data	No
255	0xFF	Result	Yes

To setup the comparison value at the DMM, please follow the following sequence:

1) DMM must be at the COMP mode,
2) Send “SET_COMP_ENTER” command to enable the change of the COMP value
3) Send the following command to change the COMP mode value
    a) “SET_COMP_MODE_HIGH_VALUE”
    b) “SET_ COMP_MODE_LOW_VALUE”
    c) “SET_COMP_MODE_INNER”
    d) “SET_COMP_MODE_OUTER”
    e) “SET_COMP_MODE_ALL”

4) Send “SET_COMP_ESC” when finish changing the COMP mode value

4.1 SET_COMP_MODE_HIGH_VALUE

This message contains the high value of the comparison mode. The high value is represented in ASIC-II format.

Header	Length	Command	High Value	Check Sum
2 Byte	1 Byte	1 Byte	7 Byte	2 Byte
Msg[0]- Msg[1]	Msg[2]	Msg[3]	Msg[4]- Msg[10]	Msg[11]- Msg[12]

4.2 SET_COMP_MODE_LOW_VALUE

This message contains the low value of the comparison mode. The low value is represented in ASIC-II format.

Header	Length	Command	Low Value	Check Sum
2 Byte	1 Byte	1 Byte	7 Byte	2 Byte
Msg[0]- Msg[1]	Msg[2]	Msg[3]	Msg[4]- Msg[10]	Msg[11]- Msg[12]

4.3 SET_COMP_MODE_ALL

This message contains the high, low, inner/outer value of the comparison mode. The high and low value is represented in ASIC-II format. The value at Inner/Outer mode is 0x00 at Inner Mode, and is 0x01 at Outer Mode.

Header	Length	Command	High Value	Low Value	Inner/Outer Mode	Check Sum
2 Byte	1 Byte	1 Byte	7 Byte	7 Byte	1 Byte	2 Byte
Msg[0]- Msg[1]	Msg[2]	Msg[3]	Msg[4]- Msg[10]	Msg[11]- Msg[17]	Msg[18]	Msg[19]- Msg[20]

4.4 Result

This message indicates the data transmission result of the message that required handshaking for guarantee of successful data exchange between PC and DMM.

Header	Length	Command	Result	Check Sum
2 Byte	1 Byte	1 Byte	1 Byte	2 Byte
Msg[0]- Msg[1]	Msg[2]	Msg[3]	Msg[4]	Msg[5]-Msg[6]

The result byte has the following value:
0x00 “Successful”
0x01 “Error-Resend-Previous-Message”
0x02 “Error-Do-Nothing”