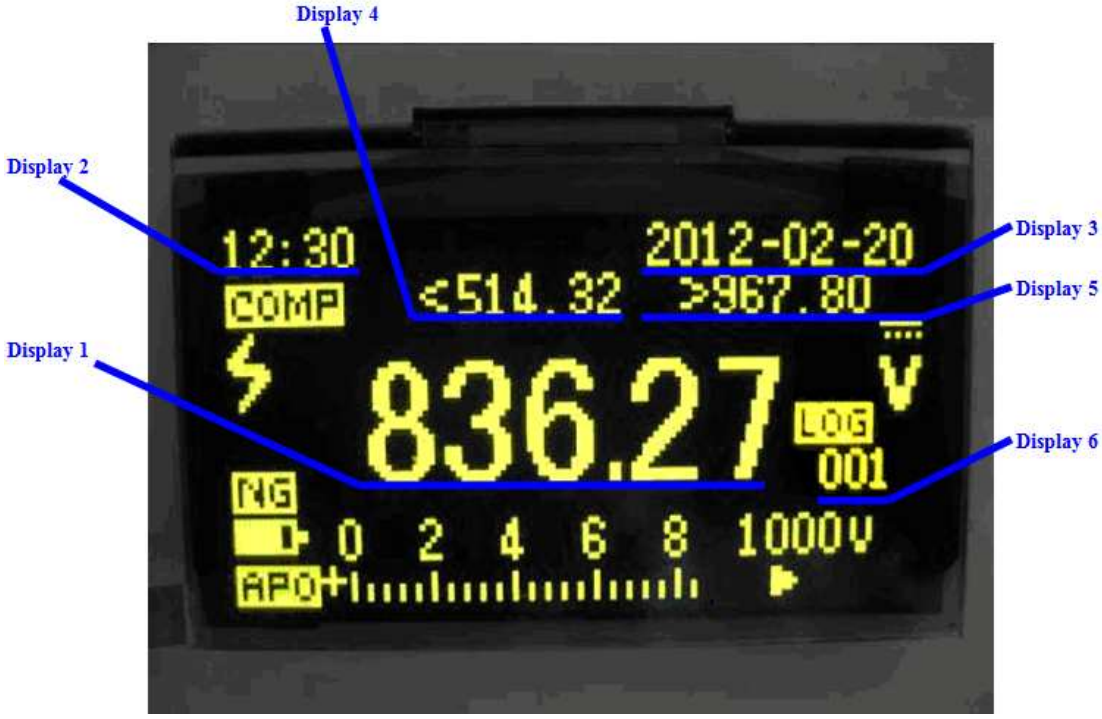
VC890 Protocol Rev 1.3 2013-1-4

1. RS-232 Serial Interface Setting Baud rate is 9600 bits

No parity
1 start bit
8 data bits (LSB first)
1 stop bit
Notes: VC890 will transfer one set of data only if PC sends out 0x5e to command the data from it, if not, no data from VC890 will be transmitted.

2.1 OLED Display

Figure below is the screen print of the OLED display of the VC890 device. Please identify the location of the display that will be described in the following document.



VC890 OLED Display

2. 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 device, 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 9 types of messages used for the 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
SETUP Data Transfer	0x05	The payload of this message contains the SETUP 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,Display5,Display6and Status. The message format is shown as in the following table.

Header	Length	Msg Type	DMM Function	Display 1	Display2	Display 3	Display 4	Display 5	Second frequency Unit	Display 6	Display Bar	Status	Check Sum
2 Byte	1 Byte	1 Byte	2 Byte	7 Byte	8 Byte	10 Byte	8 Byte	8 Byte	3 Byte	4 Byte	2	7 Byte	2 Byte
Msg[0]-Msg[1]	Msg[2]	Msg[3]	Msg[4]-Msg[5]	Msg[6]-Msg[12]	Msg[13]-Msg[20]	Msg[21]-Msg[30]	Msg[31]-Msg[38]	Msg[39]-Msg[46]	Msg[47]-Msg[49]	Msg[50]-Msg[53]	Msg[54]-Msg[55]	Msg[56]-Msg[63]	Msg[64]-Msg[65]

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 VC890 DMM is listed at the following:

Msg[4]:

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

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.

Msg[5]:

Value	DCV	ACV	DCmV	OHM	CAP	DCuA	DCmA	DCA	ACuA	ACmA	ACA	FREQ
0x30	6V	6V	600mV	600Ω	60nF	600uA	60mA	10A	600uA	60mA	10A	60Hz
0x31	60V	60V		6KΩ	600 nF	6000uA	600mA		6000uA	600mA		600Hz
0x32	600V	600V		60KΩ	6000 nF							6kHz
0x33	1000V	1000V		600KΩ	60uF							60kHz
0x34				6MΩ	600μF							600kHz
0x35				60MΩ	6000μF							6MHz
0x36					60mF							60MHz
0x37												

Display 1: Msg[6] – Msg[12]

7 bytes are used to represent the value shown on the Display 1 of the VC890 device. Please decode this value at ASIC-II string on the PC application.

Display 2: Msg[13] – Msg[20]

8 bytes are used to represent the time. Please decode this value at ASIC-II string on the PC application.

Display 3: Msg[21] – Msg[30]

10 bytes are used to represent the date. Please decode this value at ASIC-II string on the PC application.

Display 4: Msg[31] – Msg[38]

8 bytes are used to represent the value shown on the Display 4. Please decode this value at ASIC-II string on the PC application.

Display 5: Msg[39] – Msg[46]

8 bytes are used to represent the value shown on the Display 5. Please decode this value at ASIC-II string on the PC application.

Second frequency Unit: *Msg[47] – Msg[49]*

3 bytes are used to represent the value shown on frequency Unit. Please decode this value at ASIC-II string on the PC application.

Display 6: Msg[50] – Msg[53] :

4 bytes are used to represent the value shown on the Display 6. Please decode this value at ASIC-II string on the PC application.

Display Bar: *Msg[54] – Msg[55] :*

2 bytes are used to represent the value shown on bar.

Msg[54]: tens digit

Msg[55] :a digit

Status: Msg[56] – Msg[63]

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

Msg[56]:

0	0	1	1	Sign2_flag	Sign1_flag	comp_min_pol_flag	comp_max_pol_flag

comp_max_pol_flag:

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

comp_min_pol_flag:

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

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[57]

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 DISP1 is the maximum value at this range.

Min_flag:

When MIN function is on, this bit becomes 1 and the current transmitted data at DISP1 is the minimum value at this range.

Avg_flag:

When AVG function is on, this bit becomes 1 and the current transmitted data at DISP1 is the average value at this range.

Rel_flag:

When REL function is on, this bit becomes 1, and the current transmitted data at DISP1 is the relative value.

Msg[58]

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[59]

0	0	1	1	log_VOID_flag	Loz_flag	Hv_Warning_flag	Auto_power_flag

log_VOID_flag:

This bit becomes 1 ,OLED show "VOID" symbol.

Loz_flag

This bit becomes 1 if the function is LOZ

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[60]

0	0	1	1	log_H_flag	Comp_flag	Pass_flag	Inner_flag

log_H_flag*:*

This bit represents single log data status of the memory

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: 1: Inner 0: Outer

Pass_flag:

Comparison mode result: 0: No Good 1: Pass

Msg[61]

0	0	1	1	Shift_flag	Clr_flag	Bar_pol_flag	log_A_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.

log_A_flag

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

Msg[62]

0	0	1	1	bat_grade3_flag	bat_grade2_flag	bat_grade1_flag	bat_grade0_flag

Msg[62].bytes = 0x30,the battery quantum show 0 gear.

Msg[62] .bytes = 0x31,the battery quantum show 1 gear.

Msg[62] .bytes = 0x32,the battery quantum show 2 gear.

Msg[62] .bytes = 0x33,the battery quantum show 3 gear.

Msg[63]

0	0	1	1	0	Memory_Overwrite_flag	misplug_warning_flag2	misplug_warning_flag1

Msg[63].bytes&0x34 = 0x30; misplug NO EEROR

Msg[63].bytes&0x34 = 0x31;misplug EEROR ON mA INPUT

Msg[63].bytes&0x34 = 0x32;misplug EEROR ON A INPUT
Msg[63].bytes&0x34 = 0x33;misplug EEROR ON V INPUT
Memory_Overwrite_flag:
Memory Type: Overwrite

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	Display 1	Display2	Display 3	Display 4	Display 5	Second frequency Unit	Display 6	Status	Check Sum
2 Byte	1 Byte	1 Byte	2 Byte	7 Byte	8 Byte	10 Byte	8 Byte	8 Byte	3 Byte	4 Byte	5 Byte	2 Byte
Msg[0]- Msg[1]	Msg[2]	Msg[3]	Msg[4]- Msg[5]	Msg[6]- Msg[12]	Msg[13] -Msg[20]	Msg[21] -Msg[30]	Msg[31] -Msg[38]	Msg[39] -Msg[46]	Msg[47]-Msg[4 9]	Msg[50] -Msg[53]	Msg[54] -Msg[58]	Msg[59] -Msg[60]

Msg[54]: Not required

0	0	1	1	Sign2_flag	Sign1_flag	comp_min_pol_flag	comp_max_pol_flag

Msg[55]： Required

0	0	1	1	Max_flag	Min_flag	Avg_flag	Rel_flag

Msg[56] ： Not required

0	0	1	1	Ol2_flag	Ol1_flag	Manu_flag	Hold_flag

Msg[57]： Hv_Warning_flag Required

0	0	1	1	log_VOID_flag	Loz_flag	Hv_Warning_flag	Auto_power_flag

Msg[58]： Not required

0	0	1	1	log_H_flag	Comp_flag	Pass_flag	Inner_flag

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	Display 1	Display2	Display 3	Display 4	Display 5	Second frequency Unit	Display 6	Status	Check Sum
2 Byte	1 Byte	1 Byte	2 Byte	7 Byte	8 Byte	10 Byte	8 Byte	8 Byte	3 Byte	4 Byte	5 Byte	2 Byte
Msg[0]-Msg[1]	Msg[2]	Msg[3]	Msg[4]-Msg[5]	Msg[6]-Msg[12]	Msg[13]-Msg[20]	Msg[21]-Msg[30]	Msg[31]-Msg[38]	Msg[39]-Msg[46]	Msg[47]-Msg[49]	Msg[50]-Msg[53]	Msg[54]-Msg[58]	Msg[59]-Msg[60]

Msg[54]: Not required

0	0	1	1	Sign2_flag	Sign1_flag	comp_min_pol_flag	comp_max_pol_flag

Msg[55]： Required

0	0	1	1	Max_flag	Min_flag	Avg_flag	Rel_flag

Msg[56] ： Not required

0	0	1	1	OI2_flag	OI1_flag	Manu_flag	Hold_flag

Msg[57]： Hv_Warning_flag Required

0	0	1	1	log_VOID_flag	Loz_flag	Hv_Warning_flag	Auto_power_flag

Msg[58]： Not required

0	0	1	1	log_H_flag	Comp_flag	Pass_flag	Inner_flag

3.6 SETUP Data Transfer

Header	Length	Msg Type	TIME	DATE	APO TIME	COMP MAX DATA	COMP MIN DATA	COMP TYPE	SETUP MENU3	SETUP MENU4	Check Sum
2 Byte	1 Byte	1 Byte	8 Byte	10Byte	1Byte	7Byte	7 Byte	1 Byte	4 Byte	2	2 Byte
Msg[0]-Msg[1]	Msg[2]	Msg[3]	Msg[4]-Msg[11]	Msg[12]-Msg[21]	Msg[22]	Msg[23]-Msg[29]	Msg[30]-Msg[36]	Msg[37]	Msg[38]-Msg[41]	Msg[42]-Msg[43]	Msg[44]-Msg[45]

Msg[22]: APO TIME

0x30: 5 MIN

0x31: 15 MIN

0x32: 30 MIN

0x33: OFF

Msg[37]: COMP TYPE

0x30: OUTER

0x31: INNER

Msg[38]:LOGGER MEMORY

0x30: FIX

0x31: OVERWRITE

Msg[39]:LOGGER DTAT DISPLAY

0x30: ON

0x31: OFF

Msg[41] - Msg[40]:LOGGER SAMPLING RATE(1S~10S)

Msg[42]:AUTO BRIGHTNESS

0x30: ON

0x31: OFF

Msg[43]:BATTERY TYPE

0x30: ALKALINE

0x31: LI-AKKU

3.7 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”

3. 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 VC890, 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 VC890 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（SET MENU 2）	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
93	0x5d	Set date/Time ENTER(SET MENU 1)	NO
95	0X5F	Set Time VALUE	Yes
96	0X60	Set date VALUE	YES
97	0X61	Set date/Time ESC	NO
111	0X6F	Set APO Time：5 min	NO
112	0x70	Set APO Time：15 min	NO

113	0x71	Set APO Time：30 min	NO
114	0x72	Set APO Time：off min	NO
94	0x5e	PC→VC890 Send Current Value	NO
98	0X62	Enter Data Log Set (SET MENU 3)	NO
99	0X63	OLED Display Off After 5mins' Data Log	NO
100	0X64	OLED Display On After 5 mins' Data Log	NO
101	0X65	Memory Type: FIX	NO
102	0X66	Memory Type: OVERWRITE	NO
103	0X67	Continuous Sample Time	YES
104	0X68	Exit Data Log Set (SET MENU 3)	NO
105	0X69	Enter Other Set (SET MENU 4)	NO
106	0X6A	OLED Brightness Level 1 Enabled After 15 Seconds' Inactivity	NO
107	OX6B	OLED Brightness Level 1 Disabled After 15 Seconds' Inactivity	NO
108	OX6C	Battery Type: Alkaline	NO
109	0X6D	Battery Type: LI-AKKU	NO
110	0X6E	Exit Other Set (SET MENU 4)	NO
00	0x00	Get Device ID	No
01	0x01	SET_COMP_MODE_ALL	Yes
02	0X02	Comp Data	No
03	0X03	GET SETUP 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 SET _System_Time

This message sends “Check_System_Time” Command from PC to VC890 to check its internal timer

Header	Length	Command	System timer	Check Sum
2 Byte	1 Byte	1 Byte	6 Byte	2 Byte

4.5 SET _System_Date

This message sends “Check_System_Date” Command from PC to VC890 to check its internal Date

Header	Length	Command	System Date	Check Sum
2 Byte	1 Byte	1 Byte	6 Byte	2 Byte

4.6 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	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”