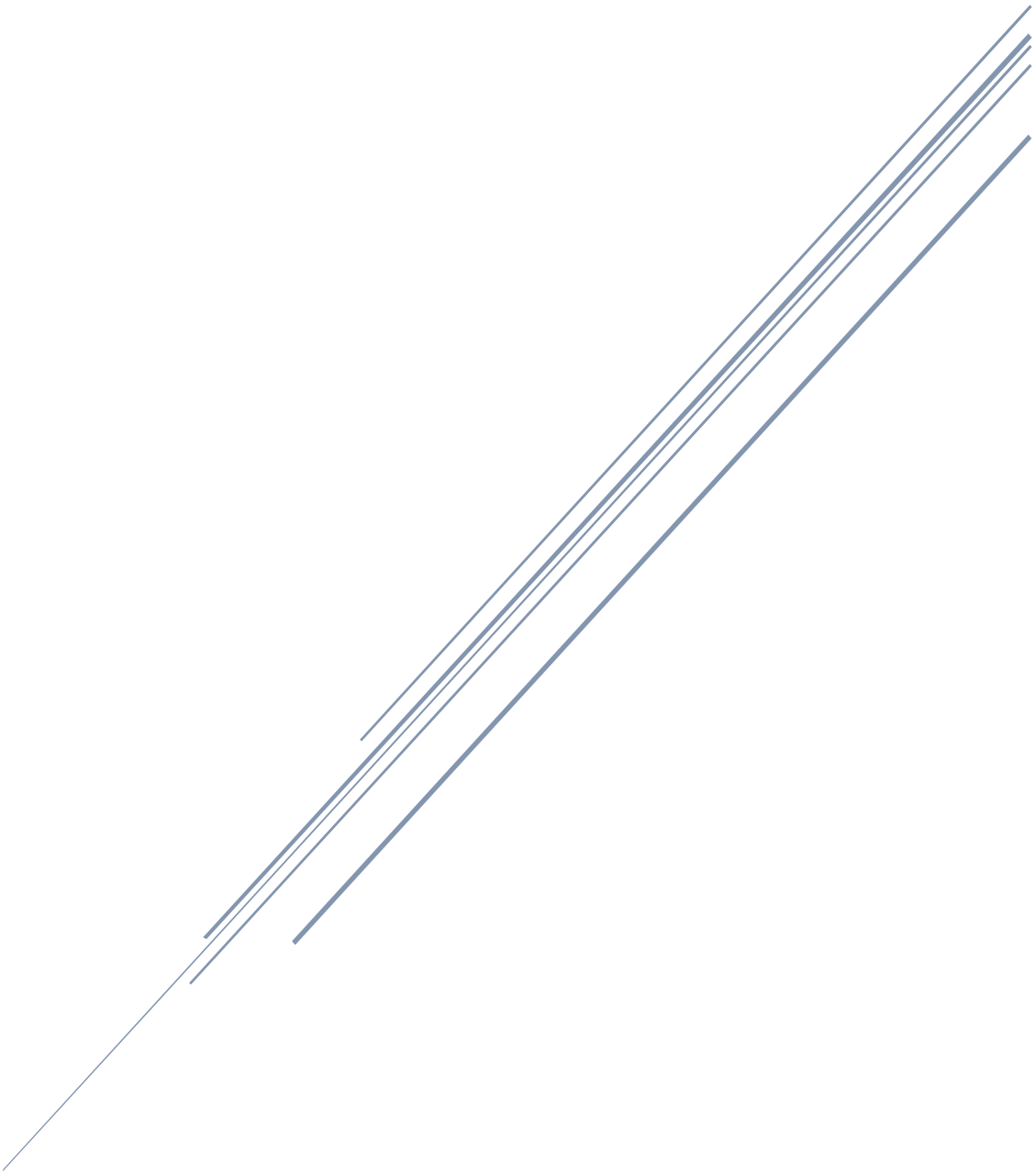
Multimeter and Millivoltmeter Programming Manual



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Version：

Version	Modified Item
V1.0	Official Version
V1.1	Add command“disp?;”; Add the relative description about UT8802\UT8802N、UT8803\UT8803N; Add code example;

Statement

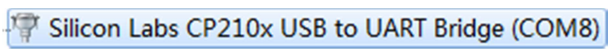
Support model

Model	Physical Interface	Communication Interface	VID&VID	Instruement Address
UT632\UT632N	USB	HID	0x1a86&0xe008	[C:DM][D:T632][T:HID][PID:0xe008][VID:0x1a86]
UT803\UT803N	USB	HID	0x1a86&0xe008	[C:DM][D:T803][T:HID][PID:0xe008][VID:0x1a86]
UT804\UT804N	USB	HID	0x1a86&0xe008	[C:DM][D:T804][T:HID][PID:0xe008][VID:0x1a86]
UT805A\UT805N	USB	COM (serial port)		[C:DM][D:T805A][T:COM][PORT:8][BAUD:9600] [PARITY:N][STOP:1][DATA:7]
UT8802\UT8802N	USB	HID	0x10c4&0xea80	[C:DM][D:T8802][T:HID][PID:0xea80][VID:0x10c4]
UT8803\UT8803N	USB	HID	0x10c4&0xea80	[C:DM][D:T8803][T:HID][PID:0xea80][VID:0x10c4]

Drive Description

The instrument with USB-HIDcommunication interface is free-drive. If the instrument with USB-HID connect with computer by USB line, it recognize that is USB serial port, please unload the drive and then use HID drive.

UT805A\UT805N use serial port to communicate, it need install USB serial port drive, it recognize COM interface on the computer



How to get USB serial port drive?

1. Please refer to the installation section in manual which attach with product; it usually store in CD or network disk.
2. If the first step can fix the problem, search USB 0f CP210X on line and download.
3. If these two step still can not handle the problem, please contact us!

Acquisition Device：

Query Instrument

Use query interface of UCI library to query which device connect with computer：

a） uci_QueryNodes

b） uci_QueryNodesX

Select suitable interface to process query device, the detailed description of query interface and example code refer to 《UCI Help Document.pdf》 or see the example project in examples files.

When filling in the device query information, you should add the device VID and PID if you want to query. For VID and PID of each model, please see the table in the section "Supported Models" .

Notes：query currently only support the device based on HID communication, COM communication does not yet add in query system.

Insert in/out notification of subscribe device

If you just want to know the device status of plug and unplug, and then do the corresponding logical operations, like turn on/off it. You can use subscription mechanism of uci plug and unplug instead of periodically querying the device to know whether the device is online. The relevant uci interface, please refer to 《UCI Help Document.pdf》 for the interface description of *uci_SetAttribute and uci_SetNotify.*

Instruction Set：

All the command text are not case-sensitive.

Data? – Read the current test data

Command Name	IO	Data	Description
data?;	Read only	Double(8Bytes)	Read the current test data

Interface：

Use read data interface

Notes：

The buffer area of interface *UT805A\UT805N*can set to 8Bytes or 16Bytes, that is the main display and secondary display of UT805A\UT805N. If it need secondary display, set it to 16Bytes（2 double type data keep successively）to read data. Other model use 1 double type data to read data.

Disp? – Read display information

Command Name	IO	Data	Description
disp?;	Read only	Double(8Bytes)	Read the current test data and status information, that is reading display on the screen.

Data Structure :

```
//@brief : data frame of multimeter and millivoltmeter
//@remark:
struct DMFRM {
    //@brief : the main display character string （20 characters）
    TCHAR MainDisp[20];
    //@brief : the secondary display character string or （20 characters）
    TCHAR AuxDisp[20];
    //@brief : the main display numeric value（8Bytes）
    double MainValue;
    //@brief : the secondary display numeric value（8Bytes）
    double AuxValue;
    //@brief : flag bit（8Bytes）
    unsigned long long Flags;
};
```

The definition of *TCHAR* as follows:

Coding Scheme	Definition	Description
UNICODE	wchar_t	16 bits UNICODE coding characters
ASCII	char	8 bits ASCII coding characters

The specific is wchar_t or char， it is based on compiling environment and uci.dll version.

Distinction :

Comparative Mode	Data?	Disp?
Data	Double（8Bytes）	struct DMFRM
Query status code	uci_Read\ uci_ReadX interface returns value>0, that is status code The detailed see the description of read data interface	DMFR.Flags is status code, the meaning of each bit refer to status bit list
Applications	It requires that acquire test value of floating point number and simple status information	It requires that data type of floating point number, the similar data display on the screen and status information

Interface

Read data：

```
u_status uci_Read(u_session _session, PRParams _params,
                  u_byte* _data, u_size _dataLen);
u_status uci_ReadX(u_session _session, u_cstring _msg, u_uint32 _timeout,
                  u_byte* _data, u_size _dataLen);
```

the detailed description of interface, please refer to《UCI Help File.pdf》， and this is the description of returns value,

Returns Value	Meaning
<0	Error codr
>0	“Data?”：status bit coding, it need to turn to 32 bits without symbol integer and then to parse it, the detailed see Status bit list
	“disp?”：it presents the data quantity of read, that is the size of DMFRM structure body（Bytes）
=0	This result is not exist.

Example

Test UT8802N in VC with UNICODE environment:

```
struct DMFRM
{
    TCHAR MainDisp[20];
    TCHAR AuxDisp[20];
    double MainValue;
    double AuxValue;
    unsigned long long Flags;
};
```

Notes：TCHAR is wide character in UNICODE environment, that is one character two bytes；

```
#define Bits(_status, _offset, _mask) ((_status >> _offset) & _mask)

std::wstring& GetUnit(unsigned char _type, unsigned char _scale, std::wstring& _s)
{
    std::wstring unit[] = {
        _T("V"), _T("A"), _T("Ω"), _T("Hz"), _T("℃"), _T("℉"),
        _T(" "), _T("F"), _T("β"), _T("%"), _T(" ")
    };
    std::wstring scale[] = {
        _T("n"), _T("μ"), _T("m"), _T(" "), _T("k"), _T("M"), _T("G"), _T(" ")
    };
```

```
    _s = _T("");
    if (_scale < sizeof(scale) / sizeof(scale[0]))
        _s += scale[_scale];
    if (_type < sizeof(unit) / sizeof(unit[0]))
        _s += unit[_type];
    return _s;
}

void _main_UT8802N_cpp()
{
    double dv = 0.0;
    DMFRM dfrm;

    ////////////////////////////////disp?/////////////////////////////
    //read
    u_status r = uci_ReadX(m_session, _T("disp?;"), 2000,
        (unsigned char*)&dfrm, sizeof(dfrm));
    if (r <= 0)
    {
        _tprintf(_T("[read : disp?]Error, r = %d; msg = %s\n"),
                r, uci_GetLastError());
        return;//error
    }

    //parse
    unsigned char unit_scale = Bits(dfrm.Flags, 8, 0xf);
    unsigned char unit_type = Bits(dfrm.Flags, 12, 0x7);
    std::wstring str_unit;
    GetUnit(unit_scale, unit_type, str_unit);

    //show
    _tprintf(_T("disp? : main = %s, aux = %s, mv = %f %s, av = %f, flags = 0x%x\n"),
        dfrm.MainDisp, dfrm.AuxDisp,
        dfrm.MainValue, str_unit.c_str(), dfrm.AuxValue, dfrm.Flags);

    ////////////////////////////////data?/////////////////////////////
    r = uci_ReadX(m_session, _T("data?;"), 2000, (unsigned char*)&dv, sizeof(dv));
    if (r <= 0)
    {
        _tprintf(_T("[read : data?]Error, r = %d; msg = %s\n"), r, uci_GetLastError());
        return;//error
    }

    unit_scale = Bits(dfrm.Flags, 8, 0xf);
```

```
        unit_type = Bits(dfrm.Flags, 12, 0x7);
        GetUnit(unit_scale, unit_type, str_unit);

        _tprintf(_T("data? : value = %f %s, flags = 0x%x\n"),
            dv, str_unit.c_str(), dfrm.Flags);
    }
```

UT8802N instrument displayed: 50.23 Hz

Programming print:

```
disp? : main = 50.23, aux = , mv = 50.230000 Hz, av = 0.000000, flags = 0x2013345
data? : value = 50.230000 Hz, flags = 0x2013345
```

Appendix

Status Bit List

"common"status bit list is suitable for all models.

Common

Bit	Digit	Meaning	Data
D0~D3	4	Functional coding	See Coding Table
D4~D5	2	AC&DC status	See Coding Table
D6	1	Whether it is Auto Range	0: no; 1: yes
D7	1	Wheter it is Over load	0: no; 1: yes
D8~D11	4	Physical unit type	See Coding Table
D12~D14	3	Physical unit magnitude	See Coding Table
D15	1	Whether it is low battery	0: no; 1: yes
D16	1	Whether it is USB communication	0: no; 1: yes
D17	1	Whether it is Under status	0: no; 1: yes
D18	1	Whether it is Over status	0: no; 1: yes
D19	1	Whether it is display minus symbol	0: no; 1: display
D20~D23	4	Position coding	See Coding Table, only use when it necessary.
D24~D27	4	Scalling position	The scalling position start from 1
D28	1	Whether it is MAX	0: no; 1: yes {apply to UT8802\UT8803 }
D29	1	Whether it is MIN	0: no; 1: yes {apply to UT8802\UT8803 }
D30	1	Whether it is relative measurement value(REL)	0: no; 1: yes {apply to UT8802\UT8803 }
D31	1	Whether it is data hold(HOLD)	0: no; 1: yes {apply to UT8802\UT8803 }

DMFR.Flags High 32 bits Status Bit List

This coding table is only apply to UT8802\UT8802N, UT8803\UT8803N

Bit	Digit	Meaning	Data
D0	1	Error flag	1:the current data error or the current display Err
D1	1	Test mode of L , C position	1:serial mode, screen display SEL; 0:parallel mode, screen display PAL
D2	1	Diode, thyristor direction pointing => from right to left	1 : valid, 0 : invalid
D3	1	Diode, thyristor direction pointing => from left to right	1 : valid, 0 : invalid
D4	1	Inductance quality element measurement	1：yes；0：no；
D5	1	Equivalent resistance measurement	1：yes；0：no；
D6	1	Capacitance loss element measurement	1：yes；0：no；
D7	1	Capacitance - equivalent resistance measurement	1：yes；0：no；
D8~D15	8	position	The detailed see：UT8802functional coding and UT8803functional coding
D16~D31	16	Hold	
D31	1	Whether it is data hold(HOLD)	0：no；1：yes{apply to UT8802\UT8803}

Functional Coding Table

There is common bit coding table and the specific model coding table, these two type can present all the position of model, please choose according to the actual situation.

Common

This functional coding table is apply to all models.

Type	Coding
Voltage measurement（Voltage）	0
Resistance measurement（OHM）	1
Diode measurement（DIODE）	2
Circuit continuit measurement (Continuity)	3
Capacitance measurement（Capacitance）	4
Frequency(FREQ)	5
Temperature measurement Fahrenheit degree (TEMPERATURE FAHRENHEIT)	6
Temperature measurement Centigrade (TEMPERATURE CENTIGRADE)	7
Triode hFE measurement, unit is β (hFE)	8
Current measurement (Current)	9
%(4-20mA)	10
Duty ratio measurement (Duty)	11

Thyristor measurement (SCR)	12
Inductance measurement（including Q :“Inductance quality element measurement”,R :“equivalent resistance”）	13

Notes

Functional coding does not divided into DCV, ACV,DCV+ACVor DCI、ACI、DCI+ACI， but it abstract to voltage and current. It can differentiate category by AC&DC status code and unit type. Other category can also differentiate by flag, such as Q,R test of inductance measurement, it has single flag to distinguish.

UT8803\UT8803N

This functional coding table is only apply to UT8803\UT8803N， data from flag bit D8~D15 in DMFR.Flags high 32 bits of command "disp?".

Position	Coding
AC voltage measurement（ACV）	0
DC current measurement（DCV）	1
AC current microampere position（ACμA）	2
AC current milliampere position（AC mA）	3
AC current standard position（AC A）	4
DC current microampere position（DCμA）	5
DC current milliampere position（DC mA）	6
DC current standard position（DC A）	7
Resistance measurement（OHM）	8
Circuit continuity measurement (Continuity)	9
Diode measurement（DIODE）	10
Inductance measurement（L）	11
Inductance measurement（Q）	12
Inductance measurement（R）	13
Capacitance measurement（Capacitance）（C）	14
Capacitance measurement（Capacitance）（D）	15
Capacitance measurement（Capacitance）（R）	16
Triode hFE measurement，unit is β(hFE)	17
Thyristor measurement (SCR)	18
Temperature measurement Centigrade (TEMPERATURE CENTIGRADE)	19
Temperature measurement Fahrenheit degree (TEMPERATURE FAHRENHEIT)	20
Frequency (FREQ)	21
Duty ratio measurement (Duty)	22

UT8802\UT8802N

This functional coding table is only apply to UT8802\UT8802N， data from flag bit D8~D15 in DMFR.Flags high 32 bits of command “disp?”.

Position	Coding
AC current milliampere position（AC 2mA）	0x10
AC current milliampere position（AC 20mA）	0x13
AC current milliampere position（AC 200mA）	0x14
AC current standard position（AC 20A）	0x18
AC current microampere position（DC 200μA）	0x0D
DC current milliampere position（DC 2mA）	0x0E
DC current milliampere position（DC 20mA）	0x11
DC current milliampere position（DC 200mA）	0x12
DC current standard position（DC 2A）	0x16
Frequency (FREQ Hz)	0x2B
Frequency (FREQ kHz)	0x2C
Frequency (FREQ MHz)	0x2D
Duty ratio measurement (Duty)	0x22
Circuit continuity measurement (Continuity)	0x24
Diode measurement（DIODE）	0x23
Resistance measurement（OHM 200Ω）	0x19
Resistance measurement（OHM 2kΩ）	0x1A
Resistance measurement（OHM 20kΩ）	0x1B
Resistance measurement（OHM 200kΩ）	0x1C
Resistance measurement（OHM 2MΩ）	0x1D
Resistance measurement（OHM 200MΩ）	0x1F
Triode hFE measurement，unit is β(hFE)	0x25
Thyristor measurement (SCR)	0x2A
DC voltage measurement（200mV）	0x01
DC voltage measurement（2V）	0x03
DC voltage measurement（20V）	0x04
DC voltage measurement（200V）	0x05
DC voltage measurement（1000V）	0x06
AC voltage measurement（2V）	0x09
AC voltage measurement（20V）	0x0A
AC voltage measurement（200V）	0x0B
AC voltage measurement（750V）	0x0C
Capacitance measurement（Capacitance nF）	0x27
Capacitance measurement（Capacitance μF）	0x28
Capacitance measurement（Capacitance mF）	0x29

Coding Table of Physical Unit Type

Type	Coding
Voltage（V）	0
Current (A)	1
Resistance (Ω)	2
Frequency (Hz)	3
Centigrade (℃)	4
Fahrenheit degree (℉)	5
RPM(rpm)hold	6
capacitance (F)	7
Triode hFE	8
Percentage (%)	9
No display	0xf

Coding Table of Physical Unit Magnitude

Type	Coding
n	0
μ	1
m	2
standard	3
K	4
M	5
G	6

AC and DC Status Coding Table

Type	Coding
OFF	0
AC	1
DC	2
AC+DC	3

Range Coding Table

UT805A\UT805N：

Coding	DCV	ACV&ACV+DCV	DCI	ACI&ACI+DCI	OHM	CAP	FEQ	Others
0	200mV	200mV	2mA	2mA	200Ω	6nF	6KHz	All range
1	2V	2V	200mA	200mA	2KΩ	60nF	60KHz	
2	20V	20V	10A	10A	20KΩ	600nF	600KHz	
3	200V	200V			200KΩ	6μF	6MHz	
4	1000V	750V			2MΩ	60μF	60MHz	
5					20MΩ	600μF		
6						6mF		
7								
8								
9								

DCV： functional coding is 0（Voltage）， AC&DC coding is 2，that is DCV；
ACV： functional coding is 0 0（Voltage）， AC&DC coding is 1，that is ACV；
ACV+DCV： functional coding is 0（Voltage）， AC&DC coding is 3，that is ACV+DCV；
DCI： functional coding is 9（Current）， AC&DC coding is 2，that is DCV；
ACI： functional coding is 9（Current）， AC&DC coding is 1，that is ACV；
ACI+DCI：functional coding is 9（Current）， AC&DC coding is 3，that is ACI+DCI；

UT804\UT804N：

Coding	ACV	DCV	OHM	CAP	℃	μA	mA	10A	Diode	FREQ	℉
0	400mV	400mV	400	--	1000	400μ	40mA	10A		40	1832
1	4V	4V	4K	40nF		4000μ	400mA			400	
2	40V	40V	40K	400nF						4K	
3	400V	400V	400K	4μF						40K	
4	1000V	1000V	4M	40μF						400K	
5			40M	400μF						4M	
6				4mF						40M	
7				40mF						400M	
8											