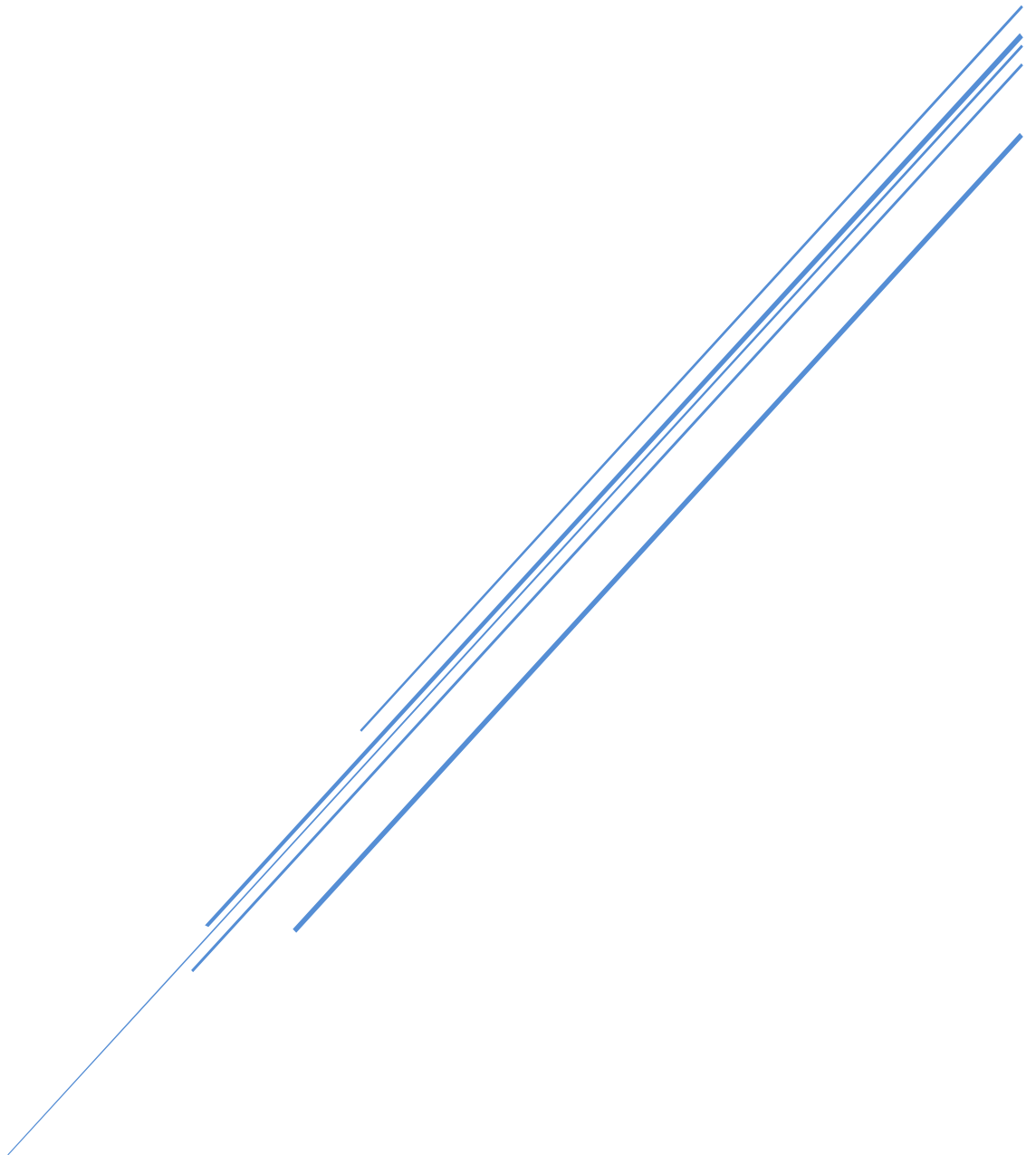


UTD2000CEX&UTD7000B Series
Oscilloscope
Programming Manual



Uni-Trend Technology (China) Co.,Ltd.

Version

Version	Modified Item
V1.0	Official version
V1.1	Add table definitions for each code in the appendix; Add the description of typical case
V1.2	Improved the description of capture waveform command
V1.3	Improved the description of channel switch and trigger level

Statement

- 1、All the command of file must issue by interface UCI of uci.dll, the detailed description refer to 《UCI Help Document.pdf》
- 2、All the character instruction is not case-sensitive;
- 3、UCI interface:
[C:DSO][D:DSO-X][T:USB][PID:0x5537][VID:0x4348][EI:0x82][EO:0x2][CFG:1][I:0]
Or use UCI interface to query device address
- 4、Connect with several similar devices, use UCI interface to query the unique device address.

Instruction Set

IDN?

Query device name

Data format : display name %internal information #SN serial number

Data size : 50Bytes

For example:

UTG2102CEX%**SN005

Communication Protocol Version

Query the version number of system information, to check whether the protocol interface is support.

Command Name	Command Parameter	Command Parameter Type
CVer?;	none	none

Example:

“CVer?;”

Interface:

Use interface `uci_Read` to read data.

Data size is 50bytes.

Data:

1,BG,100M,1GS,2CH

Keypad

Command Name	Command Parameter	Command Parameter Type
KEY	Key value	String : the abbreviation of keypad name

Keypad Name	Meaning
AT	AUTO
RS	RUN/STOP
TM	*MENU(trigger menu)
FC	FORCE
HP	HELP
VM	*MENU(window setting menu)
STZ	SET TO ZERO
MT	MATH
C1	CH1

C2	CH2
F1	F1
F2	F2
F3	F3
F4	F4
F5	F5
PS	PrScrn(screenshot)
MEA	Measure
CSR	Cursor
ACQ	Acquire
DISP	Display
STG	Storage
UTIL	Utility
FKN	Function Knob
FKNL	Function Knob Left Rotation
FKNR	Function Knob Right Rotation
VKNL	Vertical Position Knob Left Rotation
VKNR	Vertical Position Knob Right Rotation
HKNL	Horizontal Position Knob Left Rotation
HKNR	Horizontal Position Knob Right Rotation
TGKNL	Trigger Position Knob Left Rotation
TGKNR	Trigger Position Knob Right Rotation
VBKNL	Voltage Base Knob Left Rotation
VBKNR	Voltage Base Knob Right Rotation
TBKNL	Time Base Knob Left Rotation
TBKNR	Time Base Knob Right Rotation

Attribute Name	Meaning	IO	Data
Lock	Lock the key	W	No data
Unlock	Unlock the key	W	No data
Lock?	Query key status	R	Integer(4B): 0 - unlock; 1 - locked

Example

```

"KEY:AT;"
"KEY:C1;"
"KEY:MATH;"
"KEY:FKN;"    -> push
"KEY:FKNL;"   -> functional knob increase
"KEY:FKNR;"   -> functional knob decrease
"KEY:FKNL@lock;" -> functional knob increase - locked

```

Notes:

Due to different device has different key name, the abbreviation is to avoid the difference!
Use local command to **lock/unlock full qwerty (the same as UP02000CS)** .
Command with question mark should read by interface **uci_Read**.

Screenshot

Command Name	Command Parameter	Command Parameter Type
PrtScn	Image data format	String: bmp {BMP file}

For Example:

BMP file: "PrtScn:bmp;"

Notes:

"PrtScn:bmp;" use interface **uci_Read**, **buffer area size can set to 387072**, read 8 bits BMP file.

Configuration Data of Read and Write

Command Name	Command Parameter	Command Parameter Type
dconfig	none	none

For Example:

"dconfig;"

Description:

Please save the file by yourself. If time-out, it can set the long timing of overtime.

Interface:

Use interface **uci_Read** to read data, Use interface **uci_Write** to write data. Read data size can set to 1024, the actual size get from returned value.

Running Status

Command Name	Command Parameter	Data
Proc	Running status setup	Enum<string> : STOP/RUN/AUTO
Proc?	Query running status	Enum<string> : STOP/RUN/ARMD/READY/TRIGD/AUTO/SCAN/OVER/RESET { STOP/RUN/ARMED/READY/TRIGED/AUTO/SCAN/OVER/RESET }

For Example:

query: "Proc?;"

setup: "Proc:Stop;" "Proc:AUTO;"

Notes:

The difference of "Proc:Stop", "Proc:Run" and button "RUN/STOP":

It is different from button function of "RUN/STOP". Hereon "RUN" put DSO at RUN status whatever the current condition is. "STOP" is the same.

Channel Control

Command Name	Meaning	IO	Data	Remark
CHSel?	query the current selected channel	R	Channel number: 0/1/2/3/4 {CH1/ CH2/ MATH/ REF-A/ REF-B }	selected channel setup use: "CH:0@SEL;"

The Basic (Common) Attribute

Command Name	Command Parameter	Command Parameter Type	Remark
CH	Channel number	Start from 0 to number channel, integer value. 0:CH1;1:CH2	Channel number is for the command to point out which channel to process

Attribute Name	Meaning	IO	Data
EN	ON/OFF	WR	Enum(Integer): 0/1{OFF/ON }
SEL	Select (set or query select status of the current channel)	WR	W: none {command type} R: Enum(Integer): 0/1{ON/OFF}
VP	Vertical position of channel	WR	Integer : position value, the middle of screen is 128,up to plus down to minus, one grid is 25.
HP	Pre-trigger position (horizontal adjustment)	WR	Integer : position value, the middle of screen is 350,left to plus right to minus, one grid is 50.
TB	Time Base (time base)	WR	W: Enum(String) : +/- {plus/minus one grid } or current value R : Double(8Bytes), current value in US unit
VB	Voltage Base	WR	W: Enum(String) : +/- { plus/minus one grid } or voltage value R : Double(8Bytes), power source in V unit
STZ	VPOS and HPos set to zero	W	none {command type}

Support Voltage Base

1mV	10mV	100mV	1V	10V
2mV	20mV	200mV	2V	20V
5mV	50mV	500mV	5V	--

--	10ns	100ns	1us	10us	100us	1ms	10ms	100ms	1s	10s
2ns	20ns	200ns	2us	20us	200us	2ms	20ms	200ms	2s	20s
5ns	50ns	500ns	5us	50us	500us	5ms	50ms	500ms	5s	50s

Voltage base and the current base command written numeric value and unit directly, for example 100mv :
 "CH:0@VB:100MV", "CH:0@TB:500US;", unit is not case-sensitive.

For Example:

Channel number: 0/1/2/3/4{CH1/ CH2/ MATH/ REF-A/ REF-B }

setup:

```
"CH:0@EN:1@VP:128@HP:350@VB:100MV@TB:500US;"
"CH:2@EN:1;" --- open MATH channel
"CH:2@VP:128;" --- adjust the vertical position of MATH channel to 128
"CH:2@SEL;" --- select MATH channel
```

query:

```
"CH:0@VP;"
"CH:0@TB;"
"CH:0@TBV;"
```

Notes:

- 1、The command protocol of basic command and physical channel:
 The command name of basic command and physical channel both use "CH", format is "CH: channel id@Attribute:Value;" the basic command is suitable for physical channel, MATH,REF, distinguish by channel ID;
- 2、CH command and channel number should be command parameter, otherwise it be the wrong command format;
- 3、If selected channel does not open when executing command "@SEL;", return error "channel doesn't open";
- 4、If it is a physical channel (CH1/ CH2), "@VB" in fine tuning (set by "@ VD") can only set by the way of "Enum(String) : +/- {plus/minus one grid }", get the actual voltage base information from command "@VB".

Physical Channel

Command Name	Command Parameter	Command Parameter Type	Remark
CH	Channel number	Start from 0 to number channel, integer value	Channel number is for the command to point out which channel to process

Attribute Name	Meaning	IO	Data
CP	Coupling(channel coupling)	WR	Enum(String): D/A/G{DC/AC/GND}
BW	BW limit(bandwidth limit)	WR	Enum(String): Enum(Integer): 0/1{ON/OFF}
VD	Volts/Div(coarse/fine tuning of	WR	Enum(String): C/F{Coarse/Fine}

	amplitude)		
Probe	Probe (probe ratio)	WR	Enum(Decimals): 1/10/100/1000
Invert	Invert (inverse)	WR	Enum(Integer): 0/1{ON/OFF}

For Example:

“CH:0@CP:D@BW:0@VD:C@Probe:1@invert:0;”

Notes:

- 1、“CH:0;” this is an invalid command, selected channel should use command “CH:0@SEL;”
- 2、Read attribute, buffer area is 10 bytes at least, return character string, coding format of character string is based on compiler. If it is UNICODE, return character string of UNICODE coding.

Frequency Meter

Command Name	Command Parameter	Command Parameter Type	Remark
cmeter	--	--	--

Attribute Name	Meaning	IO	Data
EN	Enable(on/off)	WR	Enum(Integer<2Bytes>): 0/1
Freq?	Frequency value	R	Double<8Bytes>, in Hz unit

For Example:

“cmeter@en:1;”

“cmeter@freq?;” – read frequency value

Notes:

- 1、Frequency meter measure the channel frequency that is corresponding to trigger source.
- 2、Frequency meter is hardware measurement; the accuracy is higher than frequency parameter measurement in parameter measurement.

Parameter Measurement

Command Name	Command Parameter	Command Parameter Type	Remark
Mea	See the follow table	Character string	

Command Parameter	Meaning	IO	Data
all	Packaging read measured parameter	R	Data see MeasureParamPacket UTD2000CEX , or use the way below, read measured parameter alone
All?	Packaging read measured parameter	R	Read united data structure of all oscilloscope. Data see MeasureDataPacket:

freq	Freq	R	Double<8Bytes>
Cycle	Cycle	R	Double<8Bytes>
rtime	Rise	R	Double<8Bytes>
ftime	Fall	R	Double<8Bytes>
pwidth	+Width	R	Double<8Bytes>
nwidth	-Width	R	Double<8Bytes>
oshoot	Overshoot	R	Double<8Bytes>
pshoot	Preshoot	R	Double<8Bytes>
pduty	+Duty	R	Double<8Bytes>
nduty	-Duty	R	Double<8Bytes>
avg	Average	R	Double<8Bytes>
vpp	Peak	R	Double<8Bytes>
rms	RMS	R	Double<8Bytes>
high	High	R	Double<8Bytes>
low	Low	R	Double<8Bytes>
mid	Middle	R	Double<8Bytes>
max	Max	R	Double<8Bytes>
min	Min	R	Double<8Bytes>
amp	Amplitude	R	Double<8Bytes>

Attribute Name	Meaning	IO	Data
src	Measurement source	WR	Enum(Integer<2Bytes>): 0/1 {CH1/CH2}

For Example:

```

"mea:freq;"    --- read frequency value;
"mea:all;"     -- packaging read measured parameter
"mea:all?;"    -- packaging read all measured parameters (common)
"mea@src:0;"   --- set measurement source as CH1;

```

Code Example:

Read parameter alone:

```

double dv = 0.0;
r = uci_ReadX(m_session, _T("mea:freq"), 1000, (byte*)&dv, sizeof(dv));
if (UCISUCCESS(r)) {
    printf("Freq = %f", dv);
}

```

Packaging read all parameters:

```

namespace cb = comAPICommon; //comAPICommon alias

```

```

void Test_MeasureParams_DS0() {
    comAPICommon::MeaValue params[50];
}

```

```

    auto r = uci_ReadX(m_session, _T("mea:all?;"), 2000, (byte*)params, sizeof(params));
    ASSERT(r >= 0);

    PrintMeasureParams(params);
};

void PrintMeasureParams(comAPICommon::MeaValue* _p) {
    printf("\n+++++\n");
    PrintMeaParam(_p[cb::MP_FREQ], "freq");
    PrintMeaParam(_p[cb::MP_PERIOD], "period");

    PrintMeaParam(_p[cb::MP_NDUTY], "NDUTY");
    PrintMeaParam(_p[cb::MP_PDUTY], "PDUTY");

    PrintMeaParam(_p[cb::MP_MAX], "MAX");
    PrintMeaParam(_p[cb::MP_MIN], "MIN");

    PrintMeaParam(_p[cb::MP_PKPK], "VPP");
    PrintMeaParam(_p[cb::MP_RMS], "RMS");

    PrintMeaParam(_p[cb::MP_OVERSHOOT], "OVERSHOOT");
    PrintMeaParam(_p[cb::MP_PRESHOOT], "PRESHOOT");

    PrintMeaParam(_p[cb::MP_AMP], "AMP");

    PrintMeaParam(_p[cb::MP_RISE_TIME], "RISE_TIME");
    PrintMeaParam(_p[cb::MP_FALL_TIME], "FALL_TIME");
    printf("\n-----");
}

void PrintMeaParam(const comAPICommon::MeaValue& _p, const char * _name) {
    printf("%s = ", _name);
    if (_p.IsExist) {
        if (_p.IsValid) {
            printf("%f ", _p.Value);
        } else {
            printf("--");
        }
    } else {
        printf("NotExist");
    }

    printf(" %s\n", unit::uci_UnitFindScaleName(_p.Unit.Scale),

```

```
unit::uci_UnitFindTypeName(_p.Unit.Type));
}
```

The structure and description of `MeaValue` see: [MeasureDataPacket](#)

Capture Waveform Data

Command Name	Command Parameter	Command Parameter Type
Capture wave	Waveform format	String:.bin /.csv/.sav {binary system data/CSV file/built-in waveform file in oscilloscope}

Attribute Name	Meaning	IO	Data
CH	Channel(output channel ID)	W	Enum(Integer) : 0/1/2/3{ CH1/ CH2/CH3/CH4}
DT	Data Type(data format)	W	Enum(String) : ad/vol{ ADC initial data/voltage value}

For Example:

```
"capture wave:.bin@CH:0@DT:AD;" -- read waveform data of CH1, AD value
"capture wave:.bin@CH:0@DT:vol;" -- read waveform data of CH1, voltage value
"capture wave:.csv@CH:0@DT:vol;" -- read waveform data of CH1, voltage value, keep in CSV file
                                   (only use uci_ReadToFileX)
"capture wave:.sav@CH:0;" -- read waveform data of CH1 (.sav file)
```

Description:

- 1、“.bin” and “.csv” file must include: @CH:0” and “@DT:” attribute, and “.sav” file must include @CH:0 attribute;
- 2、This waveform data is the initial data, not display data(there are only a few hundred points), it can use in waveform analysis task;
- 3、It can use read parameter interface { `uci_Read` or `uci_ReadX` } or read file interface { `uci_ReadToFile` or `uci_ReadToFileX` }, the former keep data in buffer are of in-memory, the latter keep data in hard disk file (if it is UCI_DEMO.EXE program, please correct the corresponding suffix name.)
- 4、When use read interface `uci_ReadX`:


```
"capture wave:.bin@CH:0@DT:AD;" received the buffer area size of data: ≥64000Bytes
"capture wave:.bin@CH:0@DT:vol;" received the buffer area size of data: ≥128000Bytes
"capture wave:.sav@CH:0;" received the buffer area size of data: ≥64000Bytes
```

 Notes: the final actual valid data size, it confirmed by interface `uci_ReadX` returned value.
- 5、.sav file is belong to internal format; it can open by waveform analysis of upper computer or parse by protocol.
- 6、Waveform data format:
 - a) AD value : 16 bits short type, a waveform point of waveform data;
 - b) VOL value, that is voltage value, zero point based on channel base line.

Trigger System

Command Name	Command Parameter	Command Parameter Type	Remark
trig	--	--	--

Attribute Name	Meaning	IO	Data
t	Type	W	Enum(String) : E/V /P{ EDGE/VIDEO/PLUSE WIDTH }
src	Trigger source	W	Enum(String) : c1/c2 /ext/ac/alt{ CH1/CH2/EXT/AC LINE/ALTER }
mode	Trigger mode	W	Enum(String) : A/ N /S{ AUTO/NORMAL/SINGLE }
cp	Trigger coupling	W	Enum(String) : D/A/H/L { DCI / AC /H Restrain /L H Restrain }
pos	Trigger mode	W	Ingeger<2Bytes>: zero point based on channel base line, up to positive down to negative, each grid is 25;
st	Edge trigger slope type	W	Enum(String) : F / R /A{ Fall / Rise/Rise and Fall }

For Example:

"trig@t:e;" -- set trigger type as edge trigger;
 "trig@pos:25;" -- set trigger level higher one grid than base line, if voltage base is 1V, then trigger voltage is 1V;
 (If need to set voltage value of trigger level, convert it as the above-mentioned by yourself)

【Basic】 Written Parameter

Parameter address in this command is digital coding; it need refer to the command coding definition in file comApiDef.h
 This command is to compatible the old protocol.

Command Name	Command Parameter	Command Parameter Type	Remark
wp	--	--	--

Attribute Name	Meaning	IO	Data
CH	Channel number	W	Enum(Integer<2Bytes>): 0/1 {CH1/CH2}
addr	Parameter address (command number)	W	See definition CONTROL_CMD in file comApiDef.h

For Example:

"WP@CH:0@ADDR:950:;" -- set DISPLAY parameter

Notes:

"@CH" and "@addr" must use at the same time

【Basic】 Read Parameter

Parameter address in this command is digital coding; it need refer to the command coding definition in file comApiDef.h
 This command is to compatible the old protocol.

Command Name	Command Parameter	Command Parameter Type	Remark
rp	--	--	--

Attribute Name	Meaning	IO	Data
CH	Channel number	R	Enum(Integer<2Bytes>): 0/1 {CH1/CH2}
addr	Parameter address (command number)	R	See definition CONTROL_CMD in file comApiDef.h

For Example:

"RP@CH:0@ADDR:951:;" -- read DISPLAY parameter

Notes:

"@CH" and "@addr" must use at the same time

Case

1、Measure signal frequency and amplitude parameter

Method

1. Use parameter measure function to test signal, including frequency, amplitude, cycle etc. The detailed see Measure function: [Parameter measurement](#)
2. Use UTILITY->frequency meter to test signal frequency: [Frequency Meter](#)

Difference:

1. MEASURE is software measurement, frequency meter is hardware measurement, frequency meter test accuracy is higher;
2. Frequency meter test the signal source that is the corresponding signal of trigger source; parameter measurement test signal source that is source only can set in parameter measurement.

2、After the trigger channel is triggered, capture waveform data of the channel that is to be tested, and then deep analysis

For example: CH1 is the signal test channel which to connect with test source. CH2 is the trigger channel which to connect with trigger signal, it is usually user-defined. The aim is to find trigger timing, to capture waveform block in CH1 in corresponding time, subtract data and then analyze it.

Common model:

- 1、trigger mode set as single trigger, command: "trig@mode:s;" (use write parameter interface);
- 2、running status as RUN, command: "proc:run;" (use write parameter interface);
- 3、get running status, check running status whether is STOP, if it is STOP, that is means it's been triggered, command "proc? " (use read and write interface)
- 4、If it has been triggered, subtract waveform data, command: "[capture wave](#):.bin@CH:0@DT:vol;"

Repeat 2-4 steps to complete this model.

Appendix

MeasureParamPacket:

```
typedef struct _measure_param {  
    float value;  
    int unit;  
}MeasureParam;  
  
typedef struct  
{  
    MeasureParam freq;  
    MeasureParam period;  
    MeasureParam risetime;  
    MeasureParam falltime;  
    MeasureParam pwidth;  
    MeasureParam nwidth;  
    MeasureParam overshoot;  
    MeasureParam preshoot;  
    MeasureParam pduty;  
    MeasureParam nduty;  
    MeasureParam vmean;  
    MeasureParam vpp;  
    MeasureParam vrms;  
    MeasureParam vtop;  
    MeasureParam vbase;  
    MeasureParam vmid;  
    MeasureParam vmax;  
    MeasureParam vmin;  
    MeasureParam vamp;  
  
    //  
    char Reserve[24];  
}MeasureParamPacket_UTD2000CEX;
```

MeasureDataPacket:

Code Definition

Data packet is `MeaValue mp[50]` (400Bytes), that is fixed 50 test parameter in one dimensional sequence. `EMeaParam` defines the position of each parameter in the sequence.

```
struct UnitParam {
    char Type;        //unit type, like Time,Freq etc., define by EType
    char Scale;       //magnitude, like k, n, p, M etc., define by EScale
};

//@brief : physical quantity value
//@remark: 4Byte align -> 8Bytes
struct MeaValue {
    float    Value;
    UnitParam Unit;
    char      IsValid;  //whether is valid. 0 presents invalid; 1 presents valid.
    char      IsExist;  // whether is exist. 0 presents existence; 1 presents absent.
};
```

Definition of In-memory Table

Each parameter takes 8 bits, 50 parameter space, and 400 bytes in total.

In-memory model of each parameter:

Fields	Value	Unit.Type	Unit.Scale	Is Valid	Is Exist
Byte	4Bytes	1Byte	1Byte	1Byte	1Byte
Meaning	Physical value (decimal)	Unit type coding	Unit quantity coding	Whether is valid	Whether is existence
Data		Value	Value	0:invalid;1:valid	0:absent; 1: existence

Encoding Physical Unit

Code Definition

```
enum EScale : char {
    SCALE_p = -4,
```

```

SCALE_n,
SCALE_μ,
SCALE_m,
SCALE_STD = 0,
SCALE_K,
SCALE_M,
SCALE_G,
SCALE_T,
};

enum EType : char {
    TYPE_INVALID = -1,
    TYPE_FREQ,
    TYPE_TIME,
    TYPE_AREA,    //area (Vs)
    TYPE_SAMPLERATE, //sampling rate (Sa/s)
    TYPE_POINT,   //count (Sa)
    TYPE_VPP,     //peak-to-peak value
    TYPE_VOLTAGE, //voltage
    TYPE_CURRENT, //current
    TYPE_DB,      //DB
    TYPE_VV,      //
    TYPE_PERCENT, //percentage
    TYPE_DEGREE,  //degree
    TYPE_WATT,    //watt, power
    TYPE_UNKNOWN, // unknown unit
};

```

Coding table

Unit Coding:

Unit	Coding
p	-4
n	-3
μ	-2
m	-1
Standard unit	0
K	1
M	2
G	3
T	4

Unit Type Coding:

Unit	Coding
Invalid type	-1
frequency (Hz)	0
time (s)	1
area (Vs)	2
sampling rate (Sa/s)	3
count (Sa , pkts)	4
peak-to-peak value (VPP)	5
voltage (V)	6
current (A)	7
power (DB)	8
VV	9
percentage (%)	10
degree (°)	11
Watt (W)	12
unknown unit (U)	13

Parameter Coding

Coding Definition

```
//@brief : the common definition of parameter measurement data packet
//@remark:
enum EMeaParam {
    MP_MAX = 0, //maximum value
    MP_MIN,    //minimum value
    MP_HIGH,   //High(Top)-high level(top value)
    MP_MIDDLE, //Middle value
    MP_LOW,    //Low(Bottom) - lower level(bottom value)

    MP_PKPK,   //VPP-peak-to-peak value
    MP_AMP,    //amplitude
    MP_MEAN,   //mean value
    MP_CYCMEAN, //
    MP_RMS,    //root mean square
```

```

MP_CYCRMS,    //cycle root mean square
MP_AREA,      //area
MP_CYCAREA,   // cycle area
MP_OVERSHOOT, //overshoot
MP_PRESHOOT,  //preshoot

MP_PERIOD,    //period
MP_FREQ,      //frequency
MP_RISE_TIME, //rise time
MP_FALL_TIME, //fall time
MP_PWIDTH,    //positive pulse width

MP_NWIDTH,    //negative pulse width
MP_PDUTY,     //positive duty ratio
MP_NDUTY,     //negative duty ratio
MP_RISEDELAY, //rise delay
MP_FALLDELAY, //fall delay

MP_PHASE,     //phase
MP_FRR,       //
MP_FRF,
MP_FFR,
MP_FFF,

MP_LRF,
MP_LRR,
MP_LFR,
MP_LFF,

MP_BURST_WIDTH, //burst

//
//reserve section
//
//fixed 50 parameters
MP_MAX_COUNT = 50,
};

```

Coding Table

Parameter	Coding
Maximum value	0

Minimum value	1
High level/ top value (High/Top)	2
Middle value	3
High level/bottom value (Low)	4
Peak-to-peak value (PKPK)	5
Amplitude (AMP)	6
Mean value (MEAN)	7
Cycle mean (Cycmean)	8
Root mean square (RMS)	9
Cycle root mean square (Cycrms)	10
Area (AREA)	11
Cycle area (Cycarea)	12
Overshoot	13
Preshoot	14
Cycle	15
Frequency (Freq)	16
Rise Time	17
Fall Time	18
Positive pulse width (PWidth)	19
Negative pulse width (NWidth)	20
Positive duty ratio (PDuty)	21
Negative duty ratio (NDuty)	22
Rise delay	23
Fall delay	24
Phase	25
FRR	26
FRF	27
FFR	28
FFF	29
LRF	30
LRR	31
LFR	32
LFF	33
Burst (Burst Width)	34
Reserved	35~39

Notes:

- 1、 This model only support a part of parameter in the above table;
- 2、 Different definition name in C#Interface, put it in the name space `ucics.unit` and `ucics.meas`.

Data Unit Table:

Unit	Coding
null	0
ps	1
ns	2
μ s	3
ms	4
ks	5
nVs	7
μ Vs	8
mVs	9
μ V	11
mV	12
V	13
kV	14
pHz	18
nHz	19
μ Hz	20
mHz	21
Hz	22
KHz	23
MHz	24
GHz	25
mVV	52
VV	53
KVV	54
mDB	80
DB	81
KDB	82