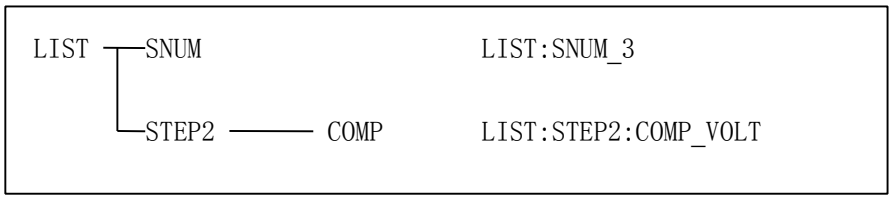
Appendix C Programmable Communications Command

The instrument communication command format written reference to the SCPI (Standard Commands for Programmable Instruments), simple and intuitive, easy to use, greatly facilitating the development of PC software.

SCPI command tree can have a maximum of three level, and the top-level command is called subsystem command. Only when subsystem command is selected, the layer under this command can be effective.The colon is used here to separate the command hierarchy.

A Command structure for example（Underscores represent spaces）:



C1 Command Rules

1． Command and data shall be transmitted in ASCII. The specified terminator is always the end of a complete command string.

E.g.: FETC?<CR>
FETCH?<LF>
FETCH?<CR><LF>

Here, <CR> and <LF> is the terminator.The instrument operator always return query results end of <CR> <LF> combination.

2．Commands out of case sensitive

E.g.: LOAD_ON 与 Load_On is completely equivalent

3． The commands and parameters are separated by spaces， before which are commands， after are parameters。

The rest of the space is invalid, and may result in an error.

In this note the underscore "_" represents a space。

4．Some commands have no parameters.

E.g.: FETCH?
TRIG

5．Colon“：”is used to separate command level， which indicates the next level of the current subsystem command.Command layer may not be back..

6．Semicolon“；” is used to separate the same level command，or to separate common command。

E.g.: LOAD：CURR_1.23；MODE_CC
*ADR_8；LOAD_OFF

7．Asterisk“*”is used to indicate common command. Common command must be in the beginning of the command string, and the subsequent command is separated by semicolon.

E.g.: *TRG

8．Comma“，”is used to separate multiple parameters. Some commands may contain multiple parameters, these parameters are separated by commas。

E.g.：TRAN：LEVA_3.21，100

9．Question mark “？ ” is used to indicate the query. Most of these commands are supported query. The instrument returns the query results as an ASCII string, and always ends a query with <CR> <LF> combination terminator .

E.g.：LOAD？Querying the current load status

In the multi-machine communication mode, only the device which is called can return the query results。

10． The data shall be sent without the unit, because the instrument will fixed the unit according to the parameter category automatically ：

Voltage unit is a "V", the current unit is "A", the power unit is the "W", the resistor unit is “Ω”;

Dynamic delay time is "ms", and the other time units are “s”;

C2 Notational Conventions

The notation here has nothing to do with the structure and rules of command, it is used for the description of the command, to facilitate reading.

NR1：Integer data

NR2：Real numbers

< > ：Angle brackets，instead of the parameters of the command

[ ] ：Brackets，which can be used or not used in brackets

_ ：Underline，instead of spaces in command string

NL ：terminator of the query，that is the combination of <CR> <LF> terminator

C3 Common Command

Common command starts with “*”， and must be in the beginning of the line.It is illegal when that is located in the command line utility command.

At RS485 multi-machine communication mode, common command can always be executed by any device under the bus , that is say it has nothing to do with the address.

Common command	Directions	Description
*TRG	Sending a bus trigger	* TRG trigger group, while the TRIG command only be executed trigger by the device called.
*IDN?	Query instrument information	Return：<Product>，<Version><NL> Product is Product Model，Version is Version Number
*ADR_<NR1>	Calling device	NR1 is the address of the device called.In the multi-machine communication mode, the device called can execute including all subsequent command of the current row, while other devices are ignored all of them. If NR1 is 0, all devices can be called.Broadcast function can be implemented.
*ADR?	Query current activities equipment	Return：<NR1><NL> NR1 is the address of current activities equipment
*LLO	Local locked	All the local key is forbade

*RTL	Back Local	Allow the device under the bus to return to the local.

C4 Subsystem Command

The instrument support subsystem command as follows：

•TRIG •FETCh? •LOAD •MMEM
•MSET •BAT •TRAN •LIST

Subsystem	Command syntax	Function	Description
TRIG (Trigger system)	TRIG[:IMM]	Bus trigger	:IMM Not necessary
	TRIG:SOUR_<sour>	Set the trigger source	sour can be： MAN——Panel TRIG key trigger EXT——External trigger BUS——Bus command trigger
	TRIG:SOUR?	Query trigger source	Return：<sour><NL>
FETCh (Read results)	FETC? 或 FETCH?	Read load testing results	1. Base load mode（CV，CC，CP，CR），return： <volt>,<curr><NL> Among it, **volt** is voltage input, NR2 format ,unit V **curr** is current input, NR2 format ,unit A 2. Battery test mode，return： <volt>,<curr>,<cap>,<time><NL> Among it, **volt** is voltage input, NR2 format ,unit V **curr** is current input, NR2 format ,unit A **time** is discharge time，NR1 format ,unit s **cap** is battery capacity，NR2 format ,unit AH 3. Other cases returns：N/A<NL>，invalid query
LOAD (Base Load)	LOAD_<state>	Start load or Close load	state is ON——Start load OFF——Close load
	LOAD?	Query load state	Return：<NR1><NL>

NR1	State	Description
0	OFF	Load close
1	CC	Constant Current
2	CV	Constant Voltage
3	CP	Constant Power
4	CR	Constant Resistance
5	OV	Over Voltage
6	OP	Over Power
7	OC	Over Current
8	HOT	Over Hot
9	R. V	Reverse Voltage
10	RUN	Running
11	UREG	Load Not Constant

			<table><tr><td>12</td><td>WAIT</td><td>Waiting</td></tr><tr><td>13</td><td>ERR</td><td>Error</td></tr><tr><td>其它</td><td>Illegal</td><td></td></tr><tr><td></td><td></td><td></td></tr></table>
	LOAD:MODE_<mode>	Set load mode	Among it，**mode** can be： **CC**——Constant Current **CV**——Constant Voltage **CP**——Constant Power **CR**——Constant Resistance **SH**——Circuit Short **BAT**——Battery Test **TRAN**——Dynamic Test
	LOAD:MODE?	Query load mode	Return：<mode><NL>
	LOAD:CURR_<data>	Set current	**data** is format of NR2
	LOAD:CURR?	Query current	Return：<NR2><NL> , NR2 contain unit “**A**”
	LOAD:VOLT_<data>	Set voltage	**data** is format of NR2
	LOAD:VOLT?	Query voltage	Return：<NR2><NL>, NR2 contain unit “**V**”
	LOAD:POW_<data>	Set power	**data** is format of NR2
	LOAD:POW?	Query power	Return：<NR2><NL>, NR2 contain unit “**W**”
	LOAD:RES_<data>	Set resistance	**data** is format of NR2
	LOAD:RES?	Query resistance	返回：<NR2><NL>, NR2 contain unit “**ohm**”
MSET (main parameter settings)	MSET:RSEN_<state>	Set the remote test switch	**state** can be： **ON**——open the remote **OFF**——close the remote
	MSET:RSEN?	Query remote	Return：<state><NL>
	MSET:IMAX_<data>	Set maximum current	**data** is format of NR2
	MSET:IMAX?	Query maximum current	Return：<NR2><NL>, NR2 contain unit “**A**”
	MSET:VMAX_<data>	Set maximum voltage	**data** is format of NR2
	MSET:VMAX?	Query maximum voltage	Return：<NR2><NL>, NR2 contain unit “**V**”
	MSET:PMAX_<data>	Set maximum power	**data** is format of NR2
	MSET:PMAX?	Query maximum power	Return：<NR2><NL>, NR2 contain unit “**W**”
	MSET:VON_<data>	Set on-voltage	**data** is format of NR2
	MSET:VON?	Query on-voltage	Return：<NR2><NL>, NR2 contain unit “**V**”
	MSET:VOFF_<data>	Set off-voltage	**data** is format of NR2
	MSET:VOFF?	Query off-voltage	Return：<NR2><NL>, NR2 contain unit “**V**”
	MSET:AOFF_<time>	Set auto-off time	**data** is format of NR1,without unit（Default seconds）
	MSET:AOFF?	Query auto-off time	Return：<NR1><NL> , NR1 contain unit “**s**”
BAT (Battery test	BAT:CURR_<data>	Set discharge current	**data** is format of NR2
	BAT:CURR?	Query discharge current	Return：<NR2><NL>, NR2 contain unit “**A**”
	BAT:VMIN_<data>	Set min-voltage	**data** is format of NR2

parameter settings)	BAT:VMIN?	Query min-voltage	Return：<NR2><NL>, NR2 contain unit “V”
TRAN (Dynamic test parameter settings)	TRAN:LMOD_<mode>	Set dynamic load type	**mode** can be： CC CV
	TRAN:LMOD?	Query dynamic load mode	Return：<mode><NL> mode 为 CC 或 CV
	TRAN:TMOD_<tmode>	Set test mode	**tmode** can be： CONT——Continuous test mode PULS——Pulse test mode TRIG——Trig test mode
	TRAN:TMOD?	Query test mode	Return：<tmode><NL> **tmode** is CONT、PULS or TRIG
	TRAN:LEVA_<data>[,<time>]	Set point A numerical and time	**data** is point A load size，NR2 format；**time** is point A pulse width，NR1format，default unit **ms** **Note**: The time setting is optional, but if you want to set the time, you can not omit the data!
	TRAN:LEVA?	Query A point parameters	Return：<data>,<time><NL> **data** is format of NR2,**time** is format of NR1，including unit **ms**
	TRAN:LEVB_<data>[,<time>]	Set point B numerical and time	**data** is point B load size，NR2 format；**time** is point B pulse width，NR1format，default unit **ms** **Note**: The time setting is optional, but if you want to set the time, you can not omit the data!
	TRAN:LEVB?	Query B point parameters	Return：<data>,<time><NL> **data** is format of NR2,**time** is format of NR1，including unit **ms**
MMEM (Storage and recall)	MMEM:SAVE_n	Save test parameters	**n** is document number from 0 to 9 to be saved,NR1 format
	MMEM:LOAD_n	Call test parameters	**n** is document number from 0 to 9 to be called,NR1 format **Note**: If the records of the file does not exist, return error

C5 Error Message

In command mode, if a command error occurs, the status information bar will display an error message, buzzer will alarm.The error message continues to show no more than 0.5 seconds.

Error message table:

Error Code	Error description	Error example
ERR00	Serial error	Serial port function error, please check the serial connection, serial port settings and so on
ERR01	Unrecognized command	**TRG:IMM** should be **TRIG:IMM**
ERR02	Incorrect command parameters	**LIST:STEP1:COMP 10.0** Limit comparator state can not be omitted when setting list comparator.It should be : **LIST:STEP1:COMP VOLT,10.0**
ERR03	Syntax error	***IDN** should be ***IDN?** **LIST_5** LIST has no top command
ERR04	Data out of range	**LOAD:CURR 5** If you have set the maximum current of 3A, the command will be error.
ERR05	Unenforceable command	If the load has been started, the **LOAD: MODE** command can not perform If the dynamic test has been started, modifying the dynamic parameters is illegal.