TECHMIZE by TONGHUI

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SCPI & MODBUS COMMAND REFERENCE

TH66000 Series

Covers the TH66000 / TH66000L / TH66000P bidirectional DC power system family: remote interfaces, SCPI command syntax and subsystem commands, and the full MODBUS RTU register map. Companion volume to the TH66000 Series Operation Manual.

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> **NOTE**
>
> SCPI is supported on all remote interfaces (RS232C, GPIB, USB, LAN); MODBUS RTU is supported only over RS232C. SCPI and MODBUS are standard capabilities across every TH66000 / TH66000L / TH66000P model that supports the relevant function — not a feature exclusive to one model. Commands specific to load-mode operation (`SINK` , `BATT` , `PV` , `MPPT`) do not apply to TH66000P (source-only) models, which have no load stage.

SECTION 1

Remote Interfaces

The TH66000 series can be controlled remotely over RS232C, LAN, USB (USB Device) or the GPIB interface, using SCPI commands; RS232C additionally supports the MODBUS RTU protocol. The 15-pin analog interface provides a separate, non-SCPI method of remote control and monitoring. Select the active interface from FUNC → COM.

1.1 RS232C

ITEM	SPECIFICATION
Signals used	TXD, RXD, GND — a minimal 3-wire subset, not the full RS-232 pinout
Baud rate	9600–115200 bps
Data format	No parity, 8 data bits, 1 stop bit
Protocol	SCPI (default) or MODBUS RTU, selectable from FUNC → COM
Terminator (SCPI)	LF (0x0A)
Max. command length (SCPI)	128 bytes

1.2 GPIB

ITEM	SPECIFICATION
Standard	IEEE 488.2
Addressing	Single address, 1–32; factory default address 8
Cabling	Total bus length ≤2 m × number of connected instruments, ≤20 m overall; up to 15 instruments on one bus; no more than 4 connectors stacked on one instrument

1.3 USB & LAN

ITEM	SPECIFICATION
USB Device	Configurable as USBTMC or a USBCDC virtual serial (VCom) port for SCPI control from a host PC
USB Host (front panel)	USB flash drive for file management, data logging and firmware upgrade — not a remote-control interface
LAN	Standard wired network interface for SCPI remote control

1.4 15-pin Analog Interface (AI)

The rear-panel 15-pin galvanically isolated analog interface allows remote control of voltage, current, power and resistance set points, remote status monitoring (CV, DC output on/off) and remote alarm monitoring (over-temperature, OVP, power failure), using 0–5 V or 0–10 V analog levels corresponding to 0–100% of the relevant nominal value. Resolution is approximately 1/26214 (10 V range) or half that (5 V range). This interface does not use SCPI or MODBUS commands.

PIN	NAME	TYPE	FUNCTION
1	VSEL	AI	Set voltage (0–100% of U_{nom})
2	CSEL	AI	Set current, source & load
3	VREF	AO	Reference voltage, 5 or 10 V (I_{max}=5 mA)
4	DGND	—	Digital signal ground
5	REMOTE	DI	LOW = remote control active
6	ALARMS 1	DO	Over-temperature / power-failure alarm
7	RSEL	AI	Set internal resistance (R mode)
8	PSEL	AI	Set power, source & load
9	VMON	AO	Actual voltage
10	CMON	AO	Actual current
11	AGND	—	Analog signal ground
12	R-ACTIVE	DI	LOW = R mode on
13	REM-SB	DI	HIGH = DC output on
14	ALARMS 2	DO	OV / OC / OP alarm
15	STATUS	DO	CV activation (LOW=CV) and DC-output status (LOW=on)

CAUTION

Do not leave an unused analog setpoint input (VSEL, CSEL, PSEL, RSEL) floating in analog remote-control mode — fix it at a defined level, or tie it to VREF for a 100% setpoint, before enabling remote control.

SECTION 2

SCPI Command Syntax Rules

SCPI (Standard Commands for Programmable Instruments) is an ASCII-based instrument command language. SCPI commands are based on a hierarchical structure (a tree system): related commands are grouped under a common node or root, forming a subsystem.

2.1 Syntax conventions

Most commands (and some parameters) are expressed in mixed case; the capitalized letters are the recognized abbreviation. Either the abbreviated or the full form may be sent. Example:

```
[SOURce[1|2]:]VOLTage:UNIT {VPP|VRMS|DBM}
[SOURce[1|2]:]FREQuency:CENTer {<frequency>|MINimum|MAXimum|DEFault}
```

- Curly braces `{ }` enclose the parameter options for the command string; the braces themselves are not sent.
- A vertical bar `|` separates alternative parameter values; e.g. `{VPP|VRMS|DBM}` means the value sent is one of `VPP`, `VRMS` or `DBM`.
- Angle brackets `<>` mark a parameter for which a value must be supplied (e.g. `<frequency>`); the brackets themselves are not sent.
- Square brackets `[ ]` mark an optional element that may be omitted; if omitted, the instrument uses its default value. For example, `SOURce[1|2]` may be sent as `SOURce`, `SOURce1`, `SOUR1`, `SOUR`, or omitted altogether — all refer to channel 1 (the SOURce node's default channel). Channel 2 must be addressed explicitly as `SOURce2` or `SOUR2`.
- `^END`: the EOI (end) signal of the IEEE-488 bus.

2.2 IEEE 488.2 common commands

The TH66000 series implements three common commands: `*IDN?`, `*TRG` and `*RST`.

COMMAND	DESCRIPTION
`*IDN?`	Read out product information. Returns `{manufacturer},{model},{firmware version}@{time}` — e.g. `Tonghui,TH6680_360_15,Ver:1.0.0@2019.09.20`.
`*TRG`	Opens (enables) output.
`*RST`	Resets the instrument to its factory default state, including all parameter settings. An automatic restart follows once the reset completes.

SECTION 3

SCPI Subsystem Commands

3.1 SYSTem Subsystem — instrument system commands

Lock command set

COMMAND	DESCRIPTION
`SYSTem:LOCK?`	Query whether remote control is active.
`SYSTem:LOCK ON/1/OFF/0`	Lock / unlock the front-panel screen.

Alarm command set

COMMAND	DESCRIPTION
`SYSTem:Alarm off`	Turn off (clear) the instrument's current alarm.
`SYSTem:alarm?`	Query the active alarm. Returns 0–13 — see Section 6, Alarm / Status Code Reference, for the code table.

Nominal command set — instrument rating queries

COMMAND	DESCRIPTION
`SYSTem:NOMinal:VOLTage?`	Query the instrument's maximum (nominal) voltage.
`SYSTem:NOMinal:CURRent?`	Query the instrument's maximum (nominal) current.
`SYSTem:NOMinal:POWer?`	Query the instrument's maximum (nominal) power.
`SYSTem:NOMinal:RESistance:MINimum?`	Query the instrument's minimum settable internal resistance.
`SYSTem:NOMinal:RESistance:MAXimum?`	Query the instrument's maximum settable internal resistance.

Normal command set — display & UI settings

COMMAND	DESCRIPTION
`SYSTem:NORmal:DEVice:CLAss?`	Query the instrument model and firmware version.
`SYSTem:NORmal:LANGuage ENG/CHN · ?`	Set the instrument UI language, or query it (0=Chinese, 1=English).
`SYSTem:NORmal:TOUChvoice ON/OFF/1/0 · ?`	Set the touch sound, or query it (0=on, 1=off).
`SYSTem:NORmal:WARningvoice ON/OFF/1/0 · ?`	Set the alarm sound, or query it (0=on, 1=off).
`SYSTem:NORmal:POWerstatus ON/OFF/1/0 · ?`	Set the power-on state, or query it (0=default, 1=user).
`SYSTem:NORmal:BL ON/OFF/1/0 · ?`	Set the backlight state, or query it (0=always on, 1=turns off after 60 s).

Config command set — source-side user events

COMMAND	DESCRIPTION
`SYSTem:CONFig:UVD <NRf>[Unit]` · `?`	Set/query user event — UVD (undervoltage detection) setting value.
`SYSTem:CONFig:OVD <NRf>[Unit]` · `?`	Set/query user event — OVD (overvoltage detection) setting value.
`SYSTem:CONFig:UVD:ACTion {NONE|WARNING|ALARM}` · `?`	Set/query user event — UVD action.
`SYSTem:CONFig:UCD <NRf>[Unit]` · `?`	Set/query user event — source UCD (undercurrent detection) setting value.
`SYSTem:CONFig:OCD <NRf>[Unit]` · `?`	Set/query user event — source OCD (overcurrent detection) setting value.
`SYSTem:CONFig:OCD:ACTion {NONE|WARNING|ALARM}` · `?`	Set/query user event — source OCD action.
`SYSTem:CONFig:OPD <NRf>[Unit]` · `?`	Set/query user event — source OPD (overpower detection) setting value.
`SYSTem:CONFig:OPD:ACTion {NONE|WARNING|ALARM}` · `?`	Set/query user event — source OPD action.
`SYSTem:CONFig:delay <NRf>[Unit]` · `?`	Set/query user event — delay time.
`SYSTem:CONFig:duration <NRf>[Unit]` · `?`	Set/query user event — duration.

Config command set — load-side (SINK) user events

COMMAND	DESCRIPTION
`SYSTem:SINK:CONFig:UCD <NRf>[Unit]` · `?`	Set/query user event — load UCD setting value.
`SYSTem:SINK:CONFig:OCD <NRf>[Unit]` · `?`	Set/query user event — load OCD setting value.
`SYSTem:SINK:CONFig:OCD:ACTion {NONE|WARNING|ALARM}` · `?`	Set/query user event — load OCD action.
`SYSTem:SINK:CONFig:OPD <NRf>[Unit]` · `?`	Set/query user event — load OPD setting value.
`SYSTem:SINK:CONFig:OPD:ACTion {NONE|WARNING|ALARM}` · `?`	Set/query user event — load OPD action.

> **NOTE**
> "User event" settings (Config command set) are independent, user-configurable detection thresholds, separate from the instrument's hardware OVP/OCP protection levels described in the Operation Manual — exceeding a user-event threshold triggers the configured action (none, warning or alarm) rather than tripping the hardware protection.

3.2 FUNCtion Subsystem — instrument function settings

Resistance command set (R mode)

COMMAND	DESCRIPTION
`FUNCtion:RESistance ON/1/OFF/0`	Turn R mode (constant internal resistance) on/off.
`FUNCtion:RESistance?`	Query whether R mode is on.

Timing command set

COMMAND	DESCRIPTION
`FUNCtion:TIMing ON/1/OFF/0 · ?`	Turn the timing/timer function on/off, or query its state.
`FUNCtion:TIMing value <NRf> · ?`	Set/query the timing time.

MS command set — master/slave

COMMAND	DESCRIPTION
`FUNCtion:MS master/slave/single`	Set the unit's role: master, slave, or stand-alone.
`FUNCtion:MS scan`	Scan for connected slaves. Returns a value: 1 = one slave found, 2 = two slaves found.
`FUNCtion:MS init`	Initialize master/slave data.

Generator command set — function generator

COMMAND	DESCRIPTION
`FUNCtion:GENerator ON/1/OFF/0`	Load / stop the function generator.
`FUNCtion:GENerator:SINe:VOLTage a b c d e f g h`	Set the function generator to sine, voltage mode. a:U(A); b:U(offs); c:f; d:U(start); e:I_{set_PS}; f:I_{set_EL}; g:P_{set_PS}; h:P_{set_EL}.
`FUNCtion:GENerator:SINe:CURRent a b c d e f g h`	Set the function generator to sine, current mode. a:I(A); b:I(offs); c:f; d:U(start); e:I_{set_PS}; f:I_{set_EL}; g:P_{set_PS}; h:P_{set_EL}.
`FUNCtion:GENerator:TRIangle:VOLTage a b c d e f g h`	Set the function generator to triangle, voltage mode (parameters per front-panel interface).
`FUNCtion:GENerator:TRIangle:CURRent a b c d e f g h`	Set the function generator to triangle, current mode.
`FUNCtion:GENerator:SQUare:VOLTage a b c d e f g h`	Set the function generator to square, voltage mode.
`FUNCtion:GENerator:SQUare:CURRent a b c d e f g h`	Set the function generator to square, current mode.
`FUNCtion:GENerator:STEP:VOLTage a b c d e f g h`	Set the function generator to step, voltage mode.
`FUNCtion:GENerator:STEP:CURRent a b c d e f g h`	Set the function generator to step, current mode.

Parameters a–h for the triangle/square/step waveforms follow the same convention as the sine command above; the exact parameter order for each waveform is shown on the front-panel function-generator setup screen.

Record command set — data logging

COMMAND	DESCRIPTION
`FUNCtion:RECord ON/1/OFF/0 · ?`	Turn the data-logging function on/off, or query its state.
`FUNCtion:RECord amount <NRf>`	Set the number of data points to record.
`FUNCtion:RECord interval <NRf>`	Set the recording time interval.

3.3 MEASure Subsystem — output value queries

COMMAND	DESCRIPTION
`MEASure:[SCALar:]VOLTage?`	Query sampled output voltage.
`MEASure:[SCALar:]CURRent?`	Query sampled output current.
`MEASure:[SCALar:]POWer?`	Query sampled output power.

3.4 OUTPut Subsystem

COMMAND	DESCRIPTION
`OUTPut ON/1/OFF/0`	Turn the DC output on/off.
`OUTPut?`	Query the output state.

3.5 SOURce Subsystem — power-mode (source) settings

Voltage command set

COMMAND	DESCRIPTION
`[SOURce:]VOLTage <NRf>[Unit] · ?`	Set/query the output voltage.
`[SOURce:]VOLTage:PROTection[:LEVel] <NRf>[Unit] · ?`	Set/query the OVP level.
`[SOURce:]VOLTage:LIMit:LOW <NRf>[Unit] · ?`	Set/query the voltage lower limit.
`[SOURce:]VOLTage:LIMit:HIGH <NRf>[Unit] · ?`	Set/query the voltage upper limit.

Current command set (source)

COMMAND	DESCRIPTION
`[SOURce:]CURRent <NRf>[Unit] · ?`	Set/query the source current.
`[SOURce:]CURRent:PROTection[:LEVel] <NRf>[Unit] · ?`	Set/query the source OCP level.
`[SOURce:]CURRent:LIMit:LOW <NRf>[Unit] · ?`	Set/query the source current lower limit.
`[SOURce:]CURRent:LIMit:HIGH <NRf>[Unit] · ?`	Set/query the source current upper limit.

Power command set (source)

COMMAND	DESCRIPTION
`[SOURce:]POWer <NRf>[Unit] · ?`	Set/query the source power.
`[SOURce:]POWer:PROTection[:LEVel] <NRf>[Unit] · ?`	Set/query the source OPP level.
`[SOURce:]POWer:LIMit:HIGH <NRf>[Unit] · ?`	Set/query the source power upper limit.

Resistance command set (source)

COMMAND	DESCRIPTION
`[SOURce:]RESistance <NRf>[Unit] · ?`	Set/query the source internal resistance (R mode).
`[SOURce:]RESistance:LIMit:HIGH <NRf>[Unit] · ?`	Set/query the source internal resistance upper limit.

3.6 SINK Subsystem — load-mode settings

> **NOTE**
> Not applicable to TH66000P (source-only) models, which have no load stage.

Current command set (load)

COMMAND	DESCRIPTION
`SINK:CURRent <NRf>[Unit] · ?`	Set/query the load current.
`SINK:CURRent:PROTection <NRf>[Unit] · ?`	Set/query the load OCP level.
`SINK:CURRent:LIMit:LOW <NRf>[Unit] · ?`	Set/query the load current lower limit.
`SINK:CURRent:LIMit:HIGH <NRf>[Unit] · ?`	Set/query the load current upper limit.

Power command set (load)

COMMAND	DESCRIPTION
`SINK:POWer <NRf>[Unit] · ?`	Set/query the load power.
`SINK:POWer:PROTection[:LEVel] <NRf>[Unit] · ?`	Set/query the load OPP level.
`SINK:POWer:LIMit:HIGH <NRf>[Unit] · ?`	Set/query the load power upper limit.

Resistance command set (load)

COMMAND	DESCRIPTION
`SINK:RESistance <NRf>[Unit] · ?`	Set/query the load internal resistance.
`SINK:RESistance:LIMit:HIGH <NRf>[Unit] · ?`	Set/query the load internal resistance upper limit.

3.7 BATT Subsystem — battery test

> **NOTE**
> Not applicable to TH66000P (source-only) models.

COMMAND	DESCRIPTION
`BATT:OFF`	Exit battery test mode.

sd (static discharge) command set

COMMAND	DESCRIPTION
`BATT:sd:set: a b c d`	Set the parameters for sd mode.
`BATT:sd:end_bat: a b c d e`	Set the end condition for sd mode.
`BATT:sd:load`	Load sd mode.

dd (dynamic discharge) command set

COMMAND	DESCRIPTION
`BATT:dd:set: a b c d e`	Set the parameters for dd mode.
`BATT:dd:end_bat: a b c d e`	Set the end condition for dd mode.
`BATT:dd:load`	Load dd mode.

sc (static charge) command set

COMMAND	DESCRIPTION
`BATT:sc:set: a b`	Set the parameters for sc mode.
`BATT:sc:end_bat: a b c d e`	Set the end condition for sc mode.
`BATT:sc:load`	Load sc mode.

dt (dynamic test) command set

COMMAND	DESCRIPTION
`BATT:dt:set: a b c d e f g h`	Set the parameters for dt mode.
`BATT:dt:end_bat: a b c d e`	Set the end condition for dt mode.
`BATT:dt:load`	Load dt mode.

Parameters a, b, c… for each BATT mode correspond to the setup fields shown on the front-panel battery-test setup screen for that mode.

3.8 UPgrade Subsystem — firmware upgrade

COMMAND	DESCRIPTION
`UPgrade:udisk api`	Upgrade the front-panel board from USB flash drive.
`UPgrade:udisk ctrl`	Upgrade the control board from USB flash drive.
`UPgrade:rs232 api [.sec file]`	Upgrade the front-panel board over the serial interface.
`UPgrade:rs232 ctrl [.sec file]`	Upgrade the control board over the serial interface.

3.9 PV Subsystem — simple photovoltaic simulation

> **NOTE**
> Load-mode function; not applicable to TH66000P (source-only) models.

COMMAND	DESCRIPTION
`PV off`	Exit PV mode.
`PV:sp:set: a b c d`	Set the parameters for simple PV simulation.
`PV:irr a`	Set the irradiance (light) value.
`PV:sp:load`	Load simple PV mode.

3.10 MPPT Subsystem — maximum power point tracking

> **NOTE**
> Load-mode function; not applicable to TH66000P (source-only) models.

COMMAND	DESCRIPTION
`MPPT off`	Exit MPPT mode.
`MPPT:save`	Save the values recorded while running in mppt4 mode.
`MPPT:rec`	Read the files required for mppt4 mode.
`MPPT:mppt1:set: a b c` · `MPPT:mppt1:load`	Set the parameters for, and load, mppt1 mode.
`MPPT:mppt2:set: a b c d` · `MPPT:mppt2:load`	Set the parameters for, and load, mppt2 mode.
`MPPT:mppt3:set: a b c d e` · `MPPT:mppt3:load`	Set the parameters for, and load, mppt3 mode.
`MPPT:mppt4:set: a b c d` · `MPPT:mppt4:load`	Set the parameters for, and load, mppt4 mode.

SECTION 4

MODBUS Protocol — Frame Format

The TH66000 series supports the MODBUS RTU protocol, available only over the RS232C interface. Writing commands support writing the values of several consecutive address registers in one operation; reading commands support reading several consecutive address registers in one operation.

4.1 Write command (function code 0x10 / 0x06)

Send: Instrument Address · Function Code · Address High · Address Low · Register Number High · Register Number Low · Total Bytes · Data Byte 1...N · CRC Low · CRC High

Return: Instrument Address · Function Code · Address High · Address Low · Register Number High · Register Number Low · CRC Low · CRC High

FIELD	DEFINITION
Instrument Address	The instrument's local bus address, set from the instrument's communication-setup screen. Range: 1–32.
Function Code	`0x10` (write multiple registers) or `0x06` (write single register).
Address High / Low	The register's storage address — see the Register Map, Section 5.
Register Number High / Low	The number of registers written in this operation; each register is 2 bytes.
Total Bytes	The total number of bytes written in this operation.
Data Byte	The value(s) being written.
CRC Low / High	CRC checksum.

WORKED EXAMPLE — WRITE SINGLE REGISTER

Set output voltage to 25.50 V (register address 0x10; 25.50 is a 4-byte float, requiring 2 registers):
Send: `08 10 00 10 00 02 04 41 CC 00 00 00 08 3C`
Return: `08 10 00 10 00 02 40 94`

WORKED EXAMPLE — WRITE MULTIPLE REGISTERS

Set output voltage to 25.50 V, source current to 88.5 A and load current to 70.5 A in one operation (register addresses must be consecutive):
Send: `08 10 00 10 00 06 0C 41 CC 00 00 00 42 B1 00 00 42 8D 00 00 47 98`
Return: `08 10 00 10 00 06 41 57`
A float value occupies 2 registers (4 bytes); a U16 value occupies 1 register (2 bytes).

4.2 Read command (function code 0x03)

Send: Instrument Address · Function Code · Address High · Address Low · Register Number High · Register Number Low · CRC Low · CRC High

Return: Instrument Address · Function Code · Total Bytes · Data Byte 1…N · CRC Low · CRC High

FIELD	DEFINITION
Instrument Address	Range: 1–32.
Function Code	`0x03` (read holding registers).
Address High / Low	The register's storage address — see the Register Map, Section 5.
Register Number High / Low	The number of registers to read; each register is 2 bytes.
Total Bytes	The total number of bytes returned.
Data Byte	The value(s) read back.
CRC Low / High	CRC checksum.

WORKED EXAMPLE — READ SINGLE REGISTER

Query output voltage (register address 0x03; the return value is one 4-byte float, requiring 2 registers):
Send: `08 03 00 03 00 02 34 92`
Return: `08 03 04 42 C7 FF 30 87 52`

WORKED EXAMPLE — READ MULTIPLE REGISTERS

Query output voltage, current and power in one operation (register address 0x03; three 4-byte floats, 12 bytes total, requiring 6 registers):
Send: `08 03 00 03 00 06 35 51`
Return: `08 03 0C 42 C7 FF 30 43 D1 BE BF 47 23 DC 00 13 58`

SECTION 5

MODBUS Register Map

Register addresses are hexadecimal. "Status" is R/W (read/write), RO (read-only) or WO (write-only).

ADDRESS	STATUS	DESCRIPTION	TYPE	BYTES
0x02	R/W	Trigger output	U16	2
0x03	RO	Read sampled output voltage	Float	4
0x04	RO	Read sampled output current	Float	4
0x05	RO	Read sampled output power	Float	4
0x06	RO	Read alarm status — values 0–13 share the same meaning as the `SYSTem:alarm?` query; see Section 6, Alarm / Status Code Reference	U16	2
0x10	R/W	Read/write voltage setting	Float	4
0x11	R/W	Read/write source current setting	Float	4
0x12	R/W	Read/write load current setting	Float	4
0x13	R/W	Read/write source power setting	Float	4
0x14	R/W	Read/write load power setting	Float	4
0x15	R/W	Read/write source internal resistance setting	Float	4
0x16	R/W	Read/write load internal resistance setting	Float	4
0x17	R/W	Read/write OVP setting	Float	4
0x18	R/W	Read/write source OCP setting	Float	4
0x19	R/W	Read/write load OCP setting	Float	4
0x1A	R/W	Read/write source OPP setting	Float	4
0x1B	R/W	Read/write load OPP setting	Float	4
0x1C	R/W	Read/write voltage lower limit	Float	4
0x1D	R/W	Read/write voltage upper limit	Float	4
0x1E	R/W	Read/write source current lower limit	Float	4
0x1F	R/W	Read/write source current upper limit	Float	4
0x20	R/W	Read/write load current lower limit	Float	4
0x21	R/W	Read/write load current upper limit	Float	4
0x22	R/W	Read/write source power upper limit	Float	4
0x23	R/W	Read/write load power upper limit	Float	4
0x24	R/W	Read/write source internal resistance upper limit	Float	4
0x25	R/W	Read/write load internal resistance upper limit	Float	4

ADDRESS	STATUS	DESCRIPTION	TYPE	BYTES
0x27	R/W	Remote control enable	U16	2
0x28	RO	Read system maximum (nominal) voltage	Float	4
0x29	RO	Read system maximum (nominal) current	Float	4
0x2A	RO	Read system maximum (nominal) power	Float	4
0x2B	RO	Read system minimum internal resistance	Float	4
0x2C	RO	Read system maximum internal resistance	Float	4
0x2E	WO	Set system language	U16	2
0x2F	WO	Set touch sound	U16	2
0x30	WO	Set alarm sound	U16	2
0x31	WO	Set power-on state	U16	2
0x32	WO	Set backlight status	U16	2
0x38	R/W	Read/write user event — UVD setting	Float	4
0x39	R/W	Read/write user event — OVD setting	Float	4
0x3A	R/W	Read/write user event — voltage action	U16	2
0x3B	R/W	Read/write user event — source UCD setting	Float	4
0x3C	R/W	Read/write user event — source OCD setting	Float	4
0x3D	R/W	Read/write user event — source current action	U16	2
0x3E	R/W	Read/write user event — source OPD setting	Float	4
0x3F	R/W	Read/write user event — source power action	U16	2
0x40	R/W	Read/write user event — delay time	U16	2
0x41	R/W	Read/write user event — hold (duration) time	U16	2
0x42	R/W	Read/write user event — load UCD setting	Float	4
0x43	R/W	Read/write user event — load OCD setting	Float	4
0x44	R/W	Read/write user event — load current action	U16	2
0x45	R/W	Read/write user event — load OPD setting	Float	4
0x46	R/W	Read/write user event — load power action	U16	2

NOTE

Addresses not listed here (e.g. 0x07–0x0F, 0x26, 0x2D, 0x33–0x37, 0x47 onward) are reserved and not part of the documented register set.

SECTION 6

Appendix — Alarm / Status Code Reference

The value returned by `SYSTem:alarm?` and MODBUS register 0x06 is one of the following 14 codes:

CODE	MEANING
0	NONE — no active alarm
1	UVD — undervoltage detected (user event)
2	OVD — overvoltage detected (user event)
3	PS_UCD — source undercurrent detected (user event)
4	PS_OCD — source overcurrent detected (user event)
5	EL_UCD — load undercurrent detected (user event)
6	EL_OCD — load overcurrent detected (user event)
7	PS_OPD — source overpower detected (user event)
8	EL_OPD — load overpower detected (user event)
9	OTP — over-temperature protection
10	PF — PFC (power factor correction) failed to start
11	PE — instrument self-test failure
12	MSP — master/slave communication error
13	VER — version/compatibility error

NOTE

Codes 1–8 (UVD/OVD/UCD/OCD/OPD) correspond to the user-configurable "user event" thresholds set via the `SYSTem:CONFig` and `SYSTem:SINK:CONFig` command sets (§3.1) — these are independent of, and in addition to, the hardware OVP/OCP/OPP protection levels documented in the Operation Manual's Performance & Specifications chapter. For the hardware protective-function codes (PF, PE, OVD/UVD, OCD/UCD, OPD/UPD, MSP, OTP) and their recommended response, see the Operation Manual, Performance & Specifications, §5.7.

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