DC Power Supply Users Manual

T3PS36006

Table of Contents

SAFETY INSTRUCTION

This chapter contains important safety instructions that you must follow when operating T3PS36006 and when keeping it in storage. Read the following before any operation to insure your safety and to keep the best condition for T3PS36006.

Safety Symbols

These safety symbols may appear in this manual or on T3PS36006.

 WARNING	Warning: Identifies conditions or practices that could result in injury or loss of life.
 CAUTION	Caution: Identifies conditions or practices that could result in damage to T3PS36006 or to other properties.
	DANGER High Voltage
	Attention Refer to the Manual
	Protective Conductor Terminal
	Earth (ground) Terminal
	I Power On; connected to AC mains. O Power Off; disconnected from AC mains.

Safety Guidelines

General Guideline

⚠ CAUTION

- Do not place any heavy object on T3PS36006.
- Avoid severe impacts or rough handling that leads to damaging T3PS36006.
- Do not discharge static electricity to T3PS36006.
- Do not block or obstruct the cooling fan vent opening.
- Leave a space around T3PS36006, at least 3cm to the left and right.
- Do not perform measurement at circuits directly connected to Mains (Note below).
- Do not disassemble T3PS36006 unless you are qualified as service personnel.

(Measurement categories) EN 61010-1:2010 specifies the measurement categories and their requirements as follows. T3PS36006 falls under category I.

- Measurement category IV is for measurement performed at the source of low-voltage installation.
- Measurement category III is for measurement performed in the building installation.
- Measurement category II is for measurement performed on the circuits directly connected to the low voltage installation.
- Measurement category I is for measurements performed on circuits not directly connected to Mains.

Power Supply

⚠ WARNING

- AC Input voltage: 115V/230V ±15%, 50/60Hz
- Connect the protective grounding conductor of the AC power cord to an earth ground, to avoid electrical shock.

Fuse

⚠ WARNING

- Fuse type: T10A/250V
- Make sure the correct type of fuse is installed before power up.

	• To ensure fire protection, replace the fuse only with the specified type and rating. • Disconnect the power cord before fuse replacement. • Make sure the cause of fuse blowout is fixed before fuse replacement.
Cleaning T3PS36006	• Disconnect the power cord before cleaning. • Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid. • Do not use chemical or cleaner containing harsh material such as benzene, toluene, xylene, and acetone.
Operation Environment	• Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below) • Relative Humidity: < 80% • Altitude: < 2000m • Temperature: 0°C to 40°C (Pollution Degree) EN 61010-1:2010 specifies the pollution degrees and their requirements as follows. T3PS36006 falls under degree 2. Pollution refers to "addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity". • Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence. • Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected. • Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled.
Storage environment	• Location: Indoor • Relative Humidity: < 70% • Temperature: −10°C to 70°C

Power cord for the United Kingdom

When using T3PS36006 in the United Kingdom, make sure the power cord meets the following safety instructions.

NOTE: This lead/appliance must only be wired by competent persons

⚠WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in this lead are coloured in accordance with the following code:

Green/ Yellow:	Earth
Blue:	Neutral
Brown:	Live (Phase)

As the colours of the wires in main leads may not correspond with the colours marking identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with the letter E or by the earth symbol ⏚ or coloured Green or Green & Yellow.

The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

If in doubt, consult the instructions provided with the equipment or contact the supplier.

This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, cable of 0.75mm² should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.

Any moulded mains connector that requires removal /replacement must be destroyed by removal of any fuse & fuse carrier and disposed of immediately, as a plug with bared wires is hazardous if a engaged in live socket. Any re-wiring must be carried out in accordance with the information detailed on this label.

OVERVIEW

This chapter describes T3PS36006, including its main features and front/ rear panel introduction. After going through the overview, follow the Setup chapter (page 20) to properly power up and set operation environment.

For initial inspection, refer to the Performance verification chapter (page 43).

T3PS36006 Main Features

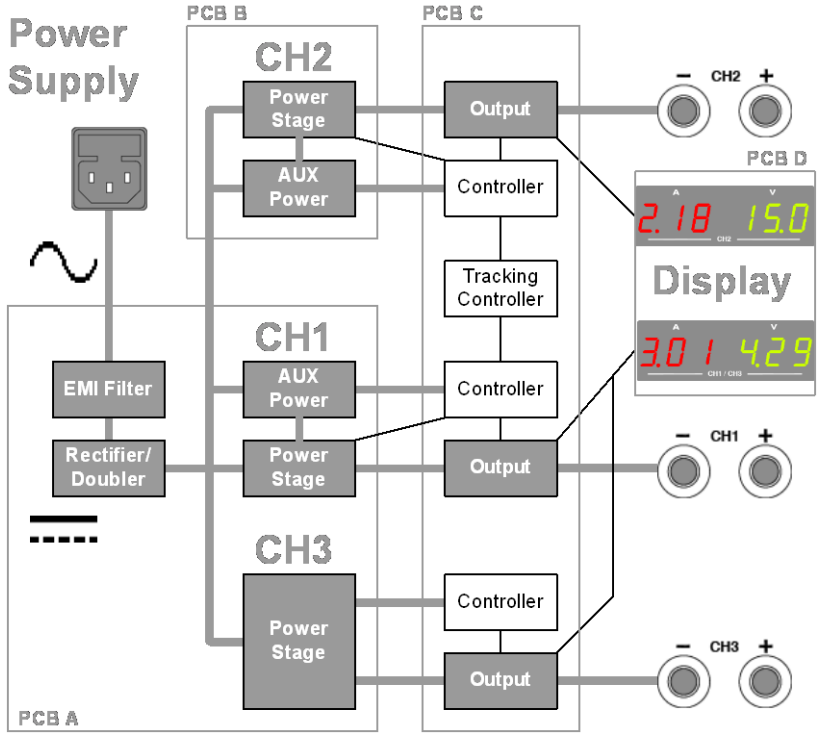
Performance	• Low noise (≤ 50dB, Cooling fan controlled by Heatsink temperature) • High efficiency power conversion, minimum 70% with full load • Fast Output On/Off response (≤100ms) • Low temperature coefficient (≤100ppm/°C+3mV, ≤150ppm/°C+3mA) • Compact size, light weight (6kg)
Operation	• Constant voltage operation • Constant current operation • Tracking Series operation • Tracking Parallel operation • Output On/Off control • 3 outputs with full Voltage control • Output range selection for CH1 and CH2, 60V/3A or 30V/6A • LED display
Protection	• Over voltage protection (OVP) • Overload protection • Reverse polarity protection
Interface	• Remote control output On/Off terminal

Principle of Operation

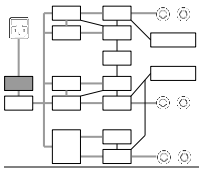
Block diagram

Power supply converts the AC mains into DC Power source for internal units. Channel 1/2/3 control and produce the actual DC output. Display shows output and OVP level, receiving feedback from each channel. Internal components are placed on four printed circuit boards, A ~ D.

Detailed description of each module starts on the next page.

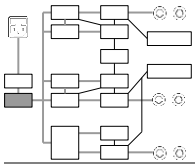


EMI Filter



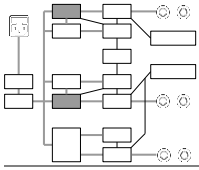
Other than deleting conduction EMI (electro-magnetic interference), the EMI unit contains protective circuits such as Inrush current limit resistor and Surge absorber. Internal units are protected under power-up sequence, normal operation, and AC mains fluctuation.

Rectifier / Doubler



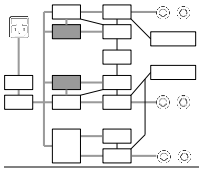
The Rectifier unit converts AC mains into DC Power source. For 115V±15% AC, double-wave rectification is used; for 230V±15% AC, full-wave rectification. An internal selector automatically switches the rectification circuit accordingly. The final DC Voltage reaches 240V ~ 370V.

CH1/2 Power Stage



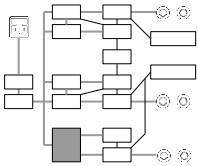
The Power stage for Channel 1 and 2 produce the outputs using the combination of Half-bridge converter and Linear regulator. The Half-bridge converter adopts PWM (pulse-width modulation) with high frequency switching. The Linear regulator adjusts the output Voltage down to 0V.

CH1/2 AUX Power



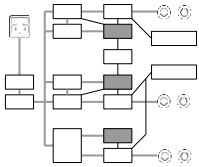
The AUX Power for Channel 1 and 2 produces the power source for auxiliary devices, such as analog/digital controller, relay, LED display, and cooling fan. Altogether four pairs of power source are generated for different purpose: ±12V, +5V, and +12V.

CH3 Power Stage



The Power stage for Channel 3 produces both the channel output and the power source for auxiliary devices. It uses the combination of Flyback converter and Linear regulator, carrying lower efficiency compared to Channel 1 and 2. The flyback converter also produces ±12V for ICs and 4~8V settable Voltage.

CH1/2/3 Controller



The Controller for Channel 1, 2, and 3 takes care of the interface between T3PS36006 and users. Several sub-units comprise the Controller, including:

- Feedback control unit
- OVP setting unit
- Fan control unit

Detailed description of each unit follows.

Feedback control unit

The Feedback control unit receives the control signal for Voltage/Current output level and the level feedback signal from the actual output. The difference between the two signals are amplified and used as the control signal for the Power stage to achieve stable output level.

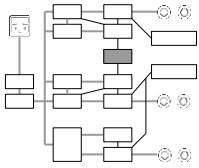
OVP setting unit

The SVR (small variable resistor) sets the protection point so that the OVP setting unit shuts down the output when the output Voltage level exceeds the configured level.

Fan control unit

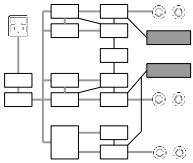
Using NTC (negative temperature coefficient) resistor, the Fan control unit changes the control Voltage for the cooling fan according to the temperature change, achieving low-noise and linear speed control.

Tracking Controller



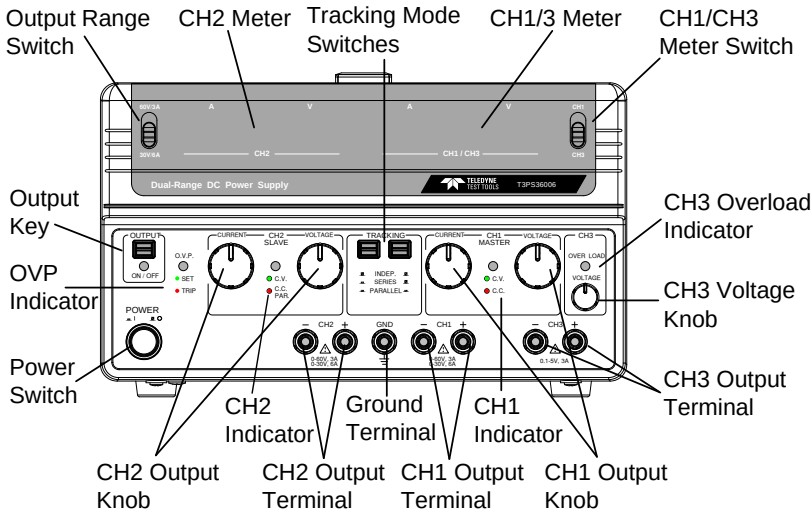
The Tracking controller controls Channel 2 output level when in tracking series or parallel mode. In tracking series mode, Channel 2 output Voltage is controlled by Channel 1 output Voltage level. In tracking parallel mode, Channel 2 output Current is controlled by Channel 1 output Current level.

LED Display



The LED display shows the Channel 1/2/3 output Voltage/Current level. The A/D converter changes the analog signal coming from each channel into digital format to be displayed.

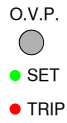
Front Panel Overview



Power switch

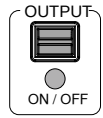
Turns On ▬ or Off ▮ the main power. For power up sequence, see page 21.

OVP indicator



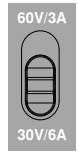
Turns green during the OVP setup. Turns red (tripped) when the output Voltage exceeds the setting. For OVP details, see page 23.

Output Key



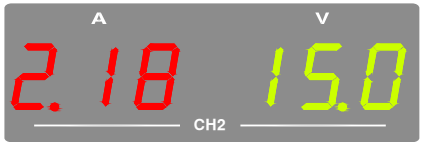
Turns the output On (green) or Off (gray), all three channels at once.

Output range switch



Selects the output range, 60V/3A or 30V/6A.

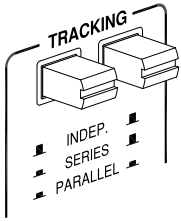
CH2 meter — Displays Channel 2 current (A) and voltage (V).



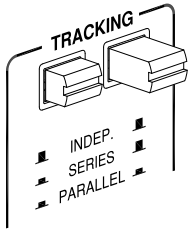
Tracking mode switches

Activates and selects the tracking mode. For tracking mode details, see page 33 (Series) and page 39 (Parallel).

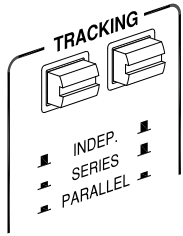
Independent



Tracking Series



Tracking Parallel



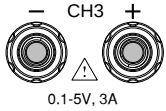
CH1/3 meter + switch

Displays Channel 1 or Channel 3 current (A) and voltage (V). The switch on the right selects the channel 1 (up) or 3 (down).

Channel 3 overload indicator

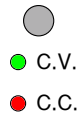
Turns red when Channel 3 output exceeds the current rating, 3A. Channel 3 switches from Constant Voltage (CV) mode to Constant Current (CC) mode.

Channel 1/2/3 output terminal



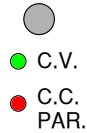
Accepts the load cables. For cable connection details, see page 25.

Channel 1
CV/CC indicator



Turns green when operating in Constant Voltage (CV) mode, red in Constant Current (CC) mode. For CV/CC characteristics, see page 19.

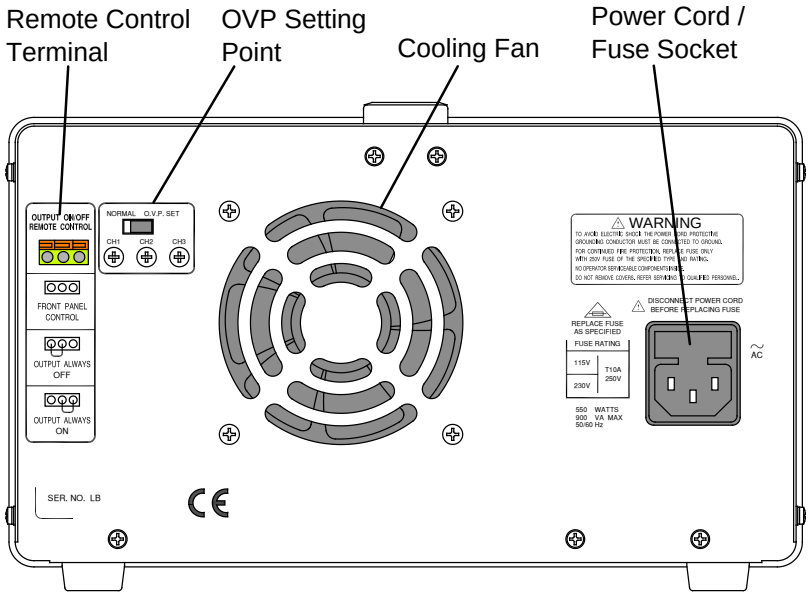
Channel 2
CV/CC/PAR
indicator



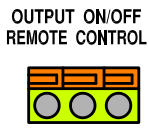
Independent mode:
Turns green in Constant Voltage (CV) mode, red in Constant Current (CC) mode.

Tracking parallel mode (page 39):
When operating in the Tracking Parallel mode, the Channel 2 indicator always stays red (PAR). Channel 1 indicator shows the CV/CC status.

Rear Panel Overview

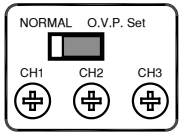


Remote control terminal



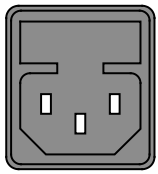
Accepts remote output On/Off control connection. For details, see page 42.

OVP setting point



Activates Over Voltage Protection (OVP) and sets the protection threshold for channel 1/2/3. For OVP setup details, see page 23.

Power cord / fuse socket



The power cord socket accepts the AC mains: 115V/230V, 50/60Hz. For power up details, see page 21.

The fuse holder contains the AC main fuse. For fuse replacement details, see page 62.

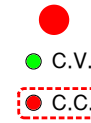
CV/CC Crossover Characteristics

Background

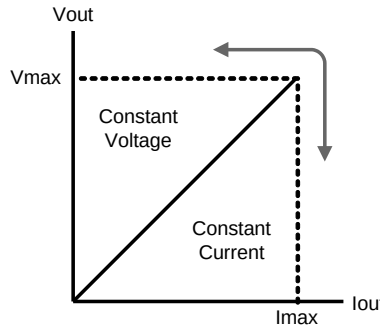
T3PS36006 automatically switches between constant voltage mode (CV) and constant current mode (CC), according to load condition.

When **the current level is smaller than the output setting**, T3PS36006 operates in **Constant Voltage mode**. The indicator on the front panel turns green (C.V.) The Voltage level is kept at the setting and the Current level fluctuates according to the load condition until it reaches the output current setting.

When **the current level reaches the output setting**, T3PS36006 starts operating in **Constant Current mode**. The indicator on the front panel turns red (C.C.) The Current level is kept at the setting but the Voltage level becomes lower than the setting, in order to suppress the output power level from overload. When the current level becomes lower than the setting, T3PS36006 goes back to the Constant Voltage mode.



Diagram



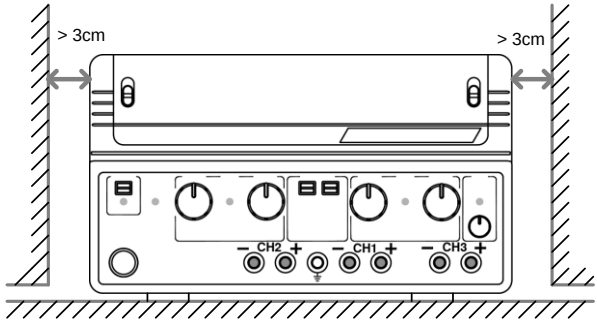
SETUP

This chapter describes how to properly power up and configure T3PS36006 before the operation. For checking the functionality, refer to the Performance verification chapter, page 43.

Installation Location

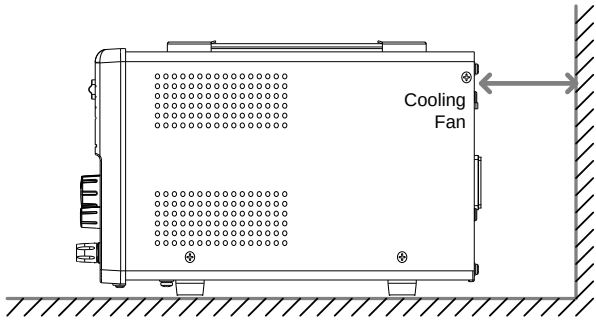
Ventillation space

Leave at least 3cm around T3PS36006, to the left and right.



Cooling fan opening

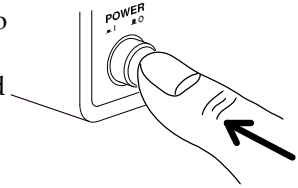
The cooling fan is located on the rear panel. Allocate extra space on the back of T3PS36006 so that the cooling fan opening would not become blocked.

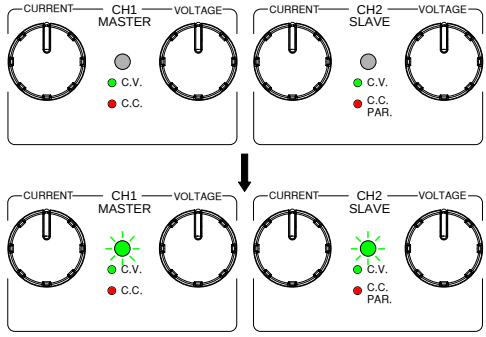


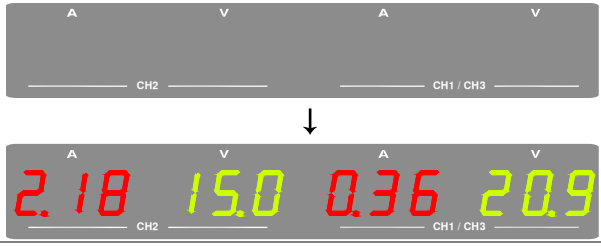
Power Up

Power On

Press the Power switch to turn On the power. The CH1/CH2 indicators and meters turn On.

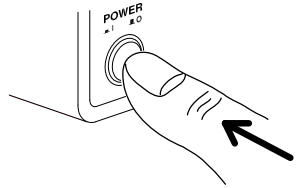






Power Off

Press the Power switch again to turn Off the power. After two seconds, the meters and indicators turn Off.



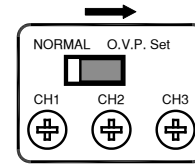
Over Voltage Protection Setup

Background

Over Voltage Protection (OVP) protects T3PS36006 and DUT from excessive output Voltage. The user sets the maximum output voltage limit before operation. When the output voltage exceeds this limit, the indicator shows the over voltage status and the output is shut off immediately.

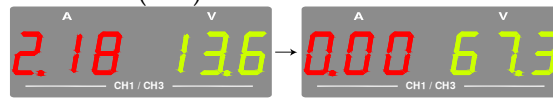
OVP setup

1. Slide the rear panel switch to the "O.V.P. SET" position.



2. The OVP indicator on the front panel turns green, indicating OVP setup.

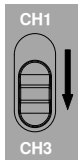
3. The Voltage meters show the OVP setting level instead of the output level. The Current meters show zero (0.00).



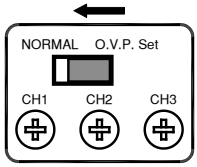
4. Adjust the OVP level using the rear panel terminal. The setting on the front panel meter changes accordingly.

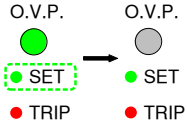
Setting range	Channel 1	1.0V ~ 67.0V
	Channel 2	1.0V ~ 67.0V
	Channel 3	0.1V ~ 6.0V

* When setting the OVP for channel 3, select CH3 meter using the CH1/CH3 meter switch.



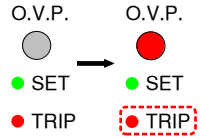
5. When finished, slide the rear panel switch to the "Normal" position. The OVP indicator on the front panel turns Off.

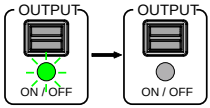




When OVP is activated....

The OVP activates when one of channel 1/2/3 output voltage exceeds the OVP setting. The indicator turns red (tripped), and the output is shut Off immediately.

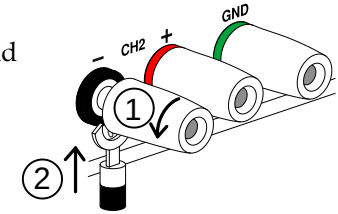




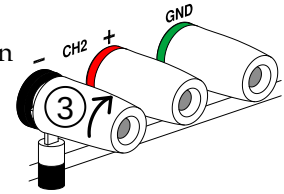
Load Cable Connection

Standard accessory (GTL-104)

1. Turn the terminal counterclockwise and loosen the screw.
2. Insert the cable terminal.

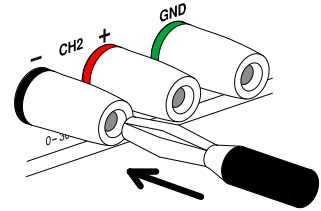


3. Turn the terminal clockwise and tighten the screw.



Banana plug

Insert the plug into the socket.



Wire type

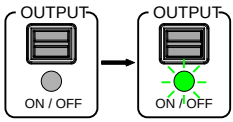
When using load cables other than the attached, make sure they have enough current capacity for minimizing cable loss and load line impedance. Voltage drop across a wire should not exceed 0.5V. The following list is the wire current rating at 450A/cm².

Wire size (AWG)	Maximum current (A)
20	2.5
18	4
16	6
14	10
12	16

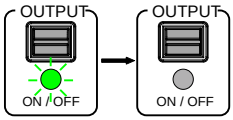
Output On/Off

Panel operation

Pressing the Output key once Turns On the output, all channels 1/2/3 at once.



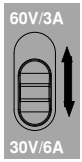
Pressing again turns Off the output.



Automatic Output Off

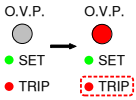
Any of the following actions during output On automatically turns it Off. They might involve sudden and harmful change in the output level.

Change the range.

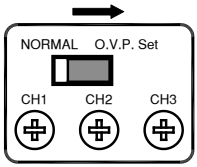


Change the tracking SW between independent/ series/ parallel.

OVP tripped.

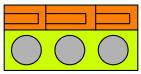


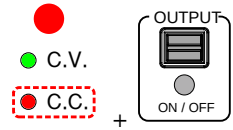
OVP SET mode.



Remote control

When in remote control mode (page 42), front panel output control is disabled.



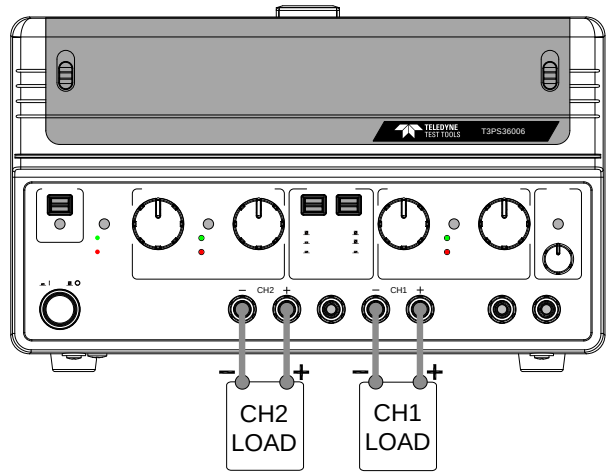
⚠ CV/CC red without output	Red CV/CC indicator when output Off indicates internal error. Contact the service center.	

OPERATION

CH1/CH2 Independent Mode

Background / Connection

Channel1 and Channel 2 outputs work independent of each other and are separately controlled.

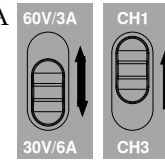


Output rating

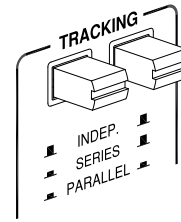
0 ~ 30V/0~6A or 0~60V/0~3A for each channel

Setting step

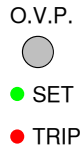
1. Select the output range, 60V/3A or 30V/6A. Set the CH1/CH3 meter switch to the CH1 position.



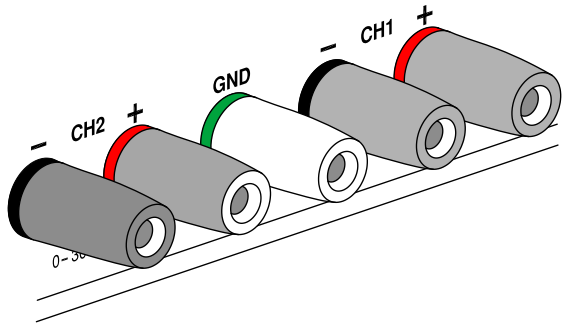
2. Set the tracking switch position to INDEP, ▪ + ▪.



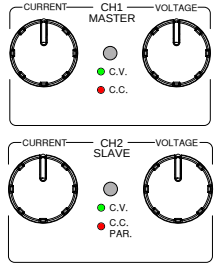
3. Set the OVP if necessary. For details, see page 23.



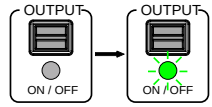
4. Connect the load to the front panel terminals, channel 1 +/−, channel 2 +/−.



5. Set the output Voltage and Current using the control knobs for each channel.

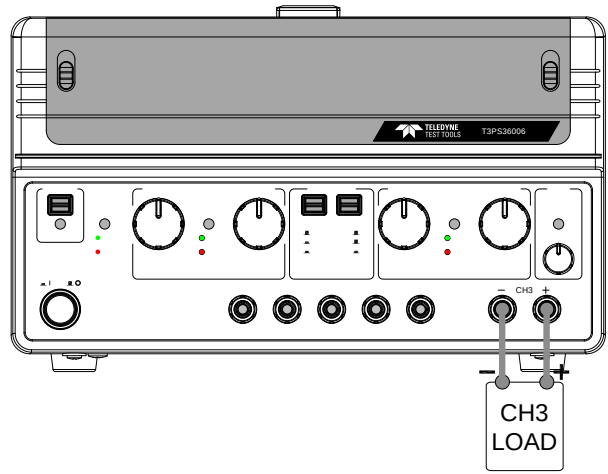


6. Press the Output key. The Output indicator turns green.



CH3 Independent Mode

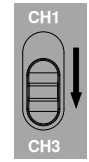
Background / Connection	Channel 3 rating is 0.1 ~ 5V, maximum 3A. It works independently from Channel 1 and 2, regardless of their modes.



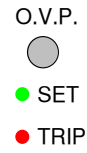
Output rating	0.1 ~ 5V, 3A maximum
No Tracking Series/Parallel	Channel 3 does not have Tracking Series/Parallel mode. Also, Channel 3 output is not affected by Channel 1 and 2 modes: independent/series/parallel.

Setting step

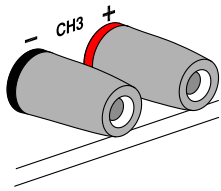
1. Set the CH1/CH3 meter switch to the CH3 position.



2. Set the OVP if necessary. For details, see page 23.

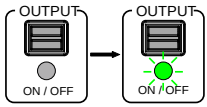


3. Connect the load to the front panel channel 3 +/− terminal.



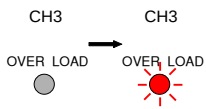
4. Set the output Voltage using the Channel 3 Voltage control knob.

5. Press the Output key. The Output indicator turns green.



CV → CC

When the output Current level exceeds 3A, the overload indicator turns red and Channel 3 operation mode switches from Constant Voltage to Constant Current.



⚠ CV/CC red without output

"Overload" in this case does not mean abnormal operation.

CH1/CH2 Tracking Series Mode

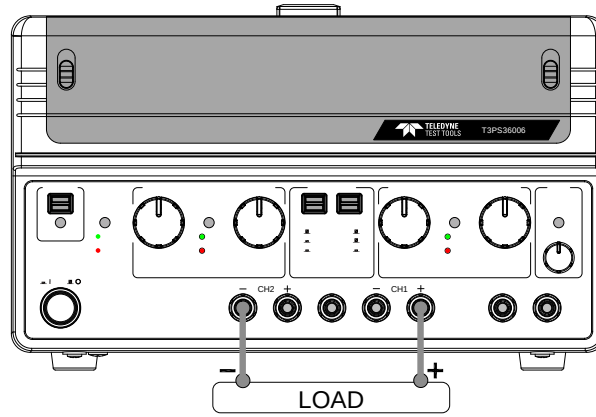
Background

Tracking series operation doubles the Voltage capacity of T3PS36006 by internally connecting Channel 1 (Master) and Channel 2 (Slave) in serial and combining the output to a single channel. Channel 1 (Master) controls the combined Voltage output level.

The following describes two types of configuration depending on the common ground usage.

Tracking series without common terminal

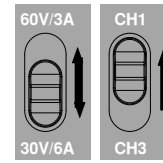
Connection



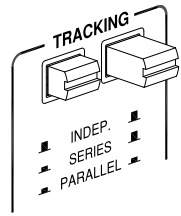
Output rating 0 ~ 120V/0 ~ 3A or 0 ~ 60V/0 ~ 6A

Setting step

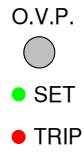
1. Select the output range, 60V (120V)/3A or 30V (60V)/6A. Set the CH1/CH3 meter switch to the CH1 position.



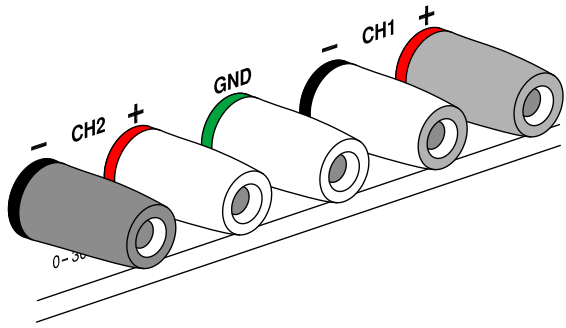
2. Set the tracking switch position to Series, ▬ + ▬.



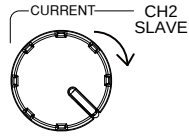
3. Set the OVP if necessary. In tracking series mode, set the Channel 2 (Slave) OVP setting to the maximum level, so that the OVP trips if the Channel 1 (Master) setting is violated. For OVP setup details, see page 23.



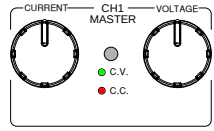
4. Connect the load to the front panel terminals, channel 1+ & channel 2− (Single supply).



5. Turn up the Channel 2 Current knob to maximum.



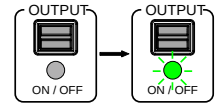
6. Set the output Voltage and Current using the Channel 1 (Master) knob.



7. Refer to the Channel 1 (Master) meter and indicator for the output setting level and CV/CC status.

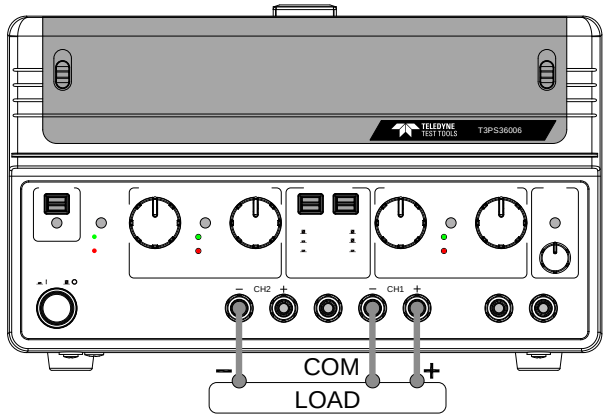
Current level	Channel 1 meter reading shows the output Current. (Channel 2 Current control must be in the Maximum position).
Voltage level	Double the reading on the Channel 1 Voltage meter. (In the above case, the actual output is 23.6 x 2 = 47.2V).

8. Press the Output key. The Output indicator turns green.



Tracking series with common terminal

Connection

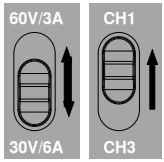


Output rating

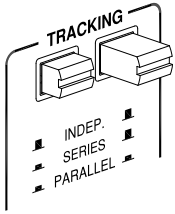
0~60V/0~3A or 0~30V/0~6A for CH1 ~ COM
0~–60V/0~3A or 0~–30V/0~6A for CH2 ~ COM

Setting step

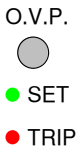
1. Select the output range, 60V (120V)/3A or 30V (60V)/6A. Set the CH1/CH3 meter switch to the CH1 position.



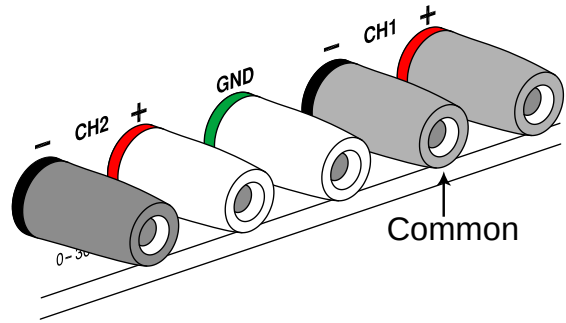
2. Set the tracking switch position to Series, ▬ + ▮.



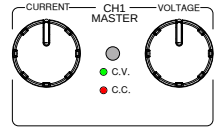
3. Set the OVP if necessary. In tracking series mode, set the Channel 2 (Slave) OVP setting to the maximum level, so that the OVP trips if the Channel 1 (Master) setting is violated. For OVP setup details, see page 23.



4. Connect the load to the front panel terminals, channel 1+ & channel 2−. Use Channel 1 (−) terminal as the common line connection.



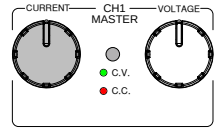
5. Set the output Voltage using the Channel 1 (Master) Voltage knob. Refer to the Channel 1 (Master) meter for the output setting level.

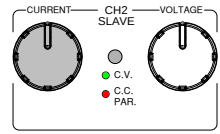


CH1(+)~COM Voltage = 23.6V in the above case

CH2(–)~COM Voltage = –23.6V in the above case

6. Set the output Current separately, using both the Channel 1 (Master) and Channel 2 (Slave) Current knob.

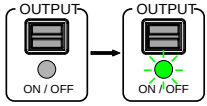




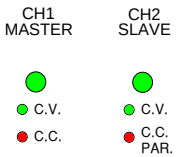
CH1(+)~COM Current = 1.84A in the above case

CH2(–)~COM Current = 2.18A in the above case

7. Press the Output key. The Output indicator turns green.



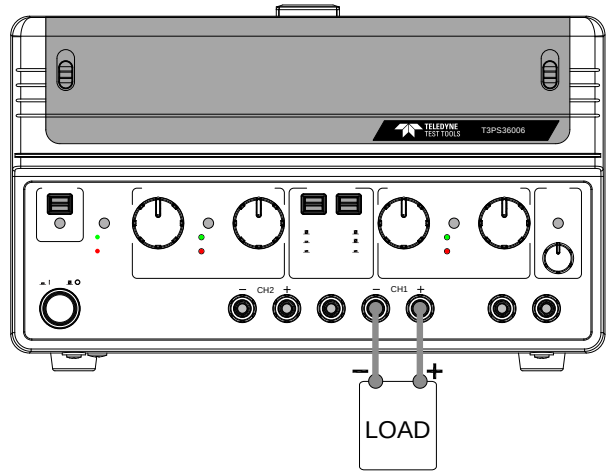
8. Refer to the Channel 1 (Master) indicator for CH1 (+) ~ COM CV/CC status, and the Channel 2 (Slave) indicator for CH2 (–) ~ COM CV/CC status.



CH1/CH2 Tracking Parallel Mode

Background / Connection

Tracking parallel operation doubles the Current capacity of T3PS36006 by internally connecting Channel 1 (Master) and Channel 2 (Slave) in parallel and combining the output to a single channel. Channel 1 (Master) controls the combined output.

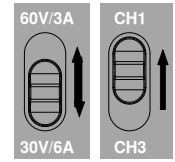


Output rating

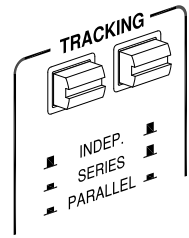
0 ~ 30V/0 ~ 12A or 0 ~ 60V/0 ~ 6A

Setting step

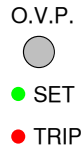
1. Select the output range, 60V/3A (6A) or 30V/6A (12A). Set the CH1/CH3 meter switch to the CH1 position.



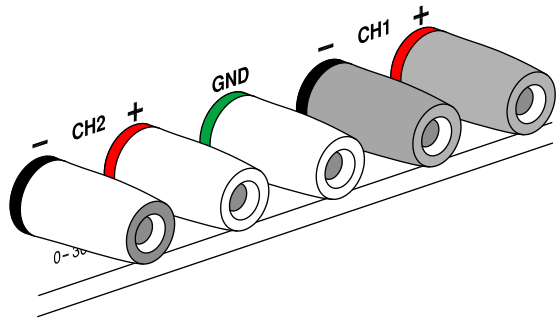
2. Set the tracking switch position to Parallel, ⎓ + ⎓.



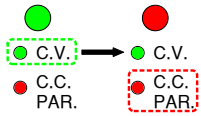
3. Set the OVP if necessary. In tracking parallel mode, set the Channel 2 (Slave) OVP setting to the maximum level, so that the OVP trips if the Channel 1 (Master) setting is violated. For OVP setup details, see page23.



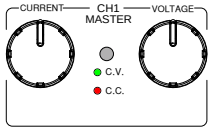
4. Connect the load to the front panel terminals, channel 1 +/−.



5. The Channel 2 (Slave) indicator turns red, indicating Tracking Parallel (PAR). The CV/CC status of tracking parallel mode is displayed in the Channel 1 (Master) indicator.



6. Set the output Voltage and Current using the Channel 1 (Master) control knobs. Channel 2 control knobs are disabled.

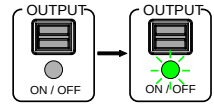


7. Refer to the Channel 1 meter for the output setting level.

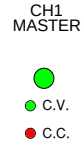
Current level Double the reading on the Channel 1 meter. In the above case, the actual output is 1.84 x 2 = 3.68A.

Voltage level Channel 1 meter reading shows the actual output Voltage.

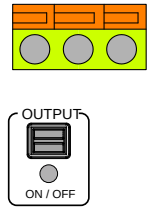
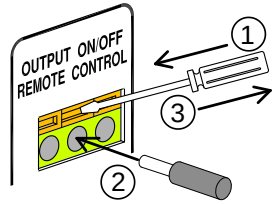
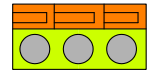
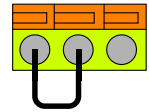
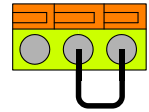
8. Press the Output key. The Output indicator turns green.



9. Refer to the Channel 1 (Master) indicator for the CV/CC status.



REMOTE OUTPUT CONTROL

Background	The remote control terminal on the rear panel can turn the output On/Off, just like the Output key on the front panel. This feature is useful for automated measurement and testing using externally connected control device, such as in production line or incoming quality inspection.	
Wire connection	Connect the terminals using bare wires. Use a minus driver to push the orange part, insert the wire, then release the orange part.	
Remote control Off (front panel control)	When there is no connection, Output On/Off is entirely controlled from the front panel.	
Output always Off	When the left two terminals are connected, the Output is always Off. The front panel Output key is disabled.	
Output always On	When the right two terminals are connected, the Output is always On. The front panel Output key is disabled.	

PERFORMANCE VERIFICATION

Overview

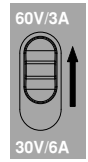
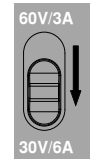
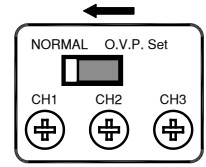
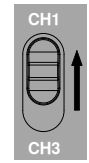
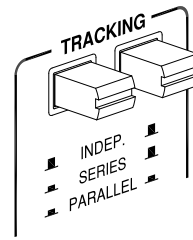
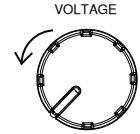
Background	Performance verification checks T3PS36006 functionality before the operation or at the incoming inspection. Recording tables are attached at the end of this chapter.
Verification item	• Output Voltage • Tracking Series Voltage • Output Current • OVP

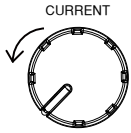
Equipment

Digital Multimeter	• DCV Accuracy < 0.1% • DCA Accuracy < 0.5% • DCA range: ≥ 12A • Resolution ≥ 4 ½ digit
Multimeter – T3PS36006 cable	• Voltage rating > 70V • Current rating > 12A
Philips screw driver	• < 3mm (for OVP adjustment)

Default T3PS36006 setting

The following is the required front and rear panel setting before running each verification.

Range	60V/3A 	30V/6A 
	• Output Voltage • Tracking Series • OVP	• Output Current • Tracking Parallel
OVP setting SW	Normal position 	
Channel 1/3 meter SW	CH1 position 	
Tracking SW	Independent position, ▪ + ▪. 	
Channel 1/2/3 Voltage knob	Minimum position 	

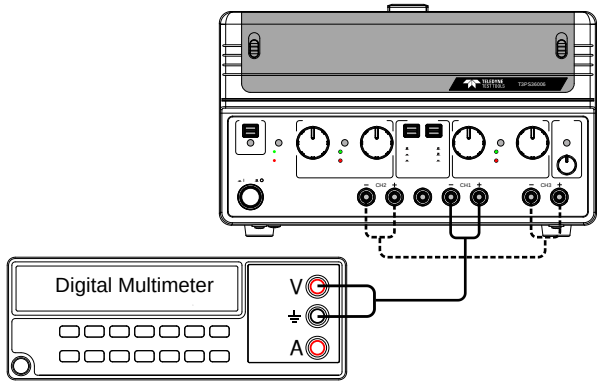
Channel 1/2 Current knob	Minimum position	

Output Voltage Verification

Check item

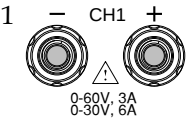
- Minimum output Voltage accuracy
- Maximum output Voltage accuracy
- Voltage meter accuracy (Output On)
- Voltage meter accuracy (Output Off)

Connection

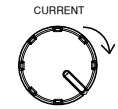


Verification step

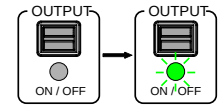
1. Set the T3PS36006 panel according to the Default setting list, page 45.
2. Connect T3PS36006 Channel 1 and Digital Multimeter Voltage terminal.



3. Power up T3PS36006 and Digital Multimeter.
4. Turn up the T3PS36006 Current knob to the maximum.



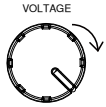
5. Turn on the T3PS36006's output.



6. Record the Multimeter reading as the Minimum output Voltage. Here is the acceptance range.

Channel 1/2	< 0V
Channel 3	< 100mV

7. Turn up the T3PS36006 Voltage knob to the maximum. Switch the Multimeter Voltage terminal if necessary.



Maximum output Voltage

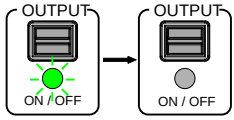
8. Record the Multimeter reading as the Maximum output Voltage. Here is the acceptance range.

Channel 1/2	61.5V ~ 62.5V
Channel 3	5.20V ~ 5.30V

Voltage meter accuracy

9. Compare and record the difference between the T3PS36006 Voltage meter and the Multimeter reading as the Voltage meter accuracy (Out On).

Then turn the output Off, and check the T3PS36006 reading again (Out Off).



Here is the acceptance range and example.

Channel 1/2/3	difference < ±(0.5% of reading + 2 digits) of Multimeter

Example:

Multimeter (Out On) = 30.00V

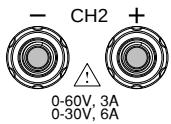
Tolerance = ±(0.005*30 + 0.2) ≈ ±0.4V

Accepted the T3PS36006 reading (Out On) = 29.6V~30.4V

Accepted the T3PS36006 reading (Out Off) = 29.6V~30.4V

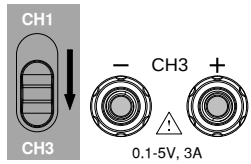
Channel 2

10. Connect the Multimeter to T3PS36006 Channel 2 and repeat step 4 to 9.



Channel 3

11. Switch the CH1/CH3 meter switch to CH3 position. Connect the Multimeter to Channel 3 and repeat step 5 to 9.



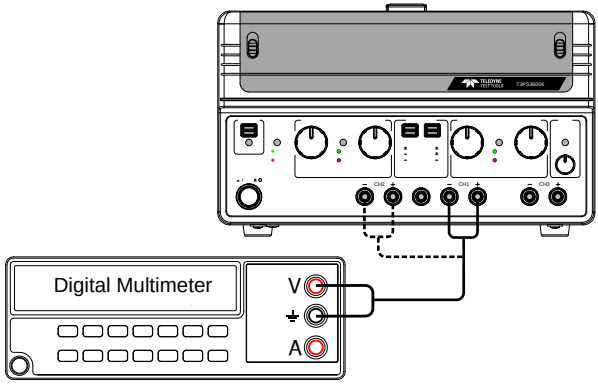
* Skip step 4 since Channel 3 does not have Current knob.

Tracking Series Voltage Verification

Check item

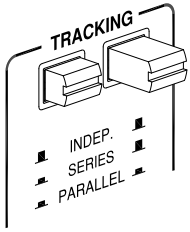
- Minimum output Voltage accuracy
- Maximum output Voltage accuracy

Connection

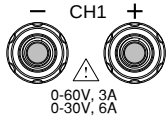


Verification step1. Set the T3PS36006 panel according to the Default setting list, page 45, except for the tracking switch (see below).

2. Set the tracking switch position to Series, ▬ + ▬.

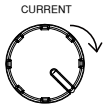


3. Connect the T3PS36006 Channel 1 and Digital Multimeter Voltage terminal.

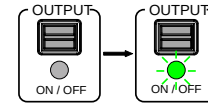


4. Power up the T3PS36006 and Digital Multimeter.

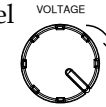
5. Turn up the T3PS36006 Current knob, both Channel 1 and Channel 2, to the maximum.



6. Turn on the T3PS36006's output.



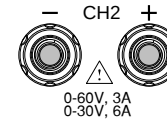
7. Turn up the T3PS36006 Channel 1 Voltage knob until the Multimeter reading shows 1.000V.



(1.000V)

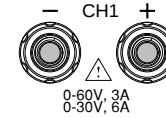
Minimum tracking series output voltage

8. Connect the Multimeter to T3PS36006 Channel 2 and record the reading. Here is the acceptance range.

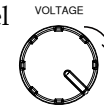


Channel 2	0.985V ~ 1.015V

9. Connect Digital Multimeter back to T3PS36006 Channel 1.



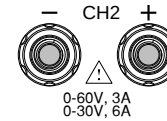
10. Turn up the T3PS36006 Channel 1 Voltage knob until the Multimeter reading shows 60.00V.



(60.00V)

Maximum tracking series output voltage

11. Connect the Multimeter to the T3PS36006 Channel 2 and record the reading. Here is the acceptance range.



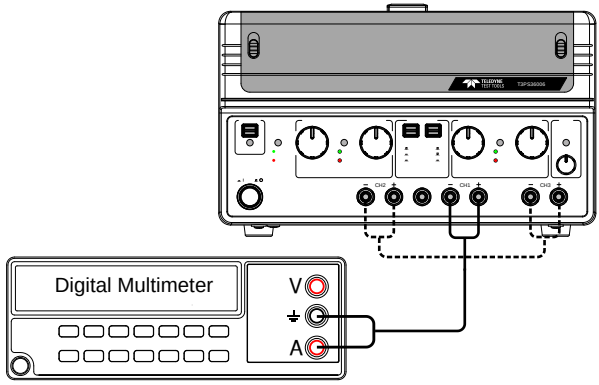
Channel 2	59.69V ~ 60.31V

Output Current verification

Check item

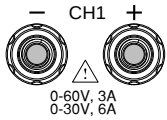
- Minimum output Current accuracy
- Maximum output Current accuracy
- Current meter accuracy (Output On)
- Current meter accuracy (Output Off)

Connection

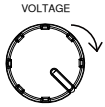


Verification step

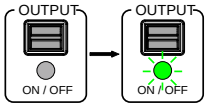
1. Set the T3PS36006 panel according to the Default setting list, page 45.
2. Connect the T3PS36006 Channel 1 and Digital Multimeter Current terminal.



3. Power up the T3PS36006 and Digital Multimeter.
4. Turn up the T3PS36006 Voltage knob to the maximum.



5. Turn on the T3PS36006's output.

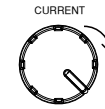


Minimum output Current

6. Record the Multimeter reading as the Minimum output Current. Here is the acceptance range.

Channel 1/2	< 0A

7. Turn up the T3PS36006 Current knob to the maximum. Switch the Multimeter Current terminal to high current range.



Maximum output Current

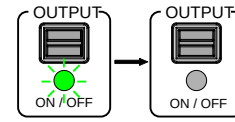
8. Record the Multimeter reading as the Maximum output Current. Here is the acceptance range.

Channel 1/2	6.15A ~ 6.25A
Channel 3	3.05A ~ 3.15A

Current meter accuracy

9. Compare and record the difference between the T3PS36006 Current meter and the Multimeter reading as the Current meter accuracy (Out On).

Then turn the output Off, and check the T3PS36006 reading again (Out Off).



Here is the acceptance range and example.

Channel 1/2/3	difference < ±(0.5% of reading + 2 digits) of Multimeter

Example:

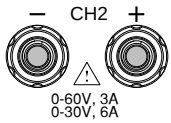
Multimeter (Out On) = 3.000A

Tolerance = ±(0.005*3 + 0.02) ≈ ±0.04A

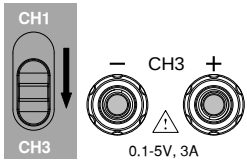
Accepted the T3PS36006 reading (Out On) = 2.96A~3.04A

Accepted the T3PS36006 reading (Out Off) = 2.96A~3.04A

10. Connect the Multimeter to the T3PS36006 Channel 2 and repeat step 4 to 9.



11. Connect the Multimeter to the T3PS36006 Channel 3 and repeat step 4, 5, 8, 9.



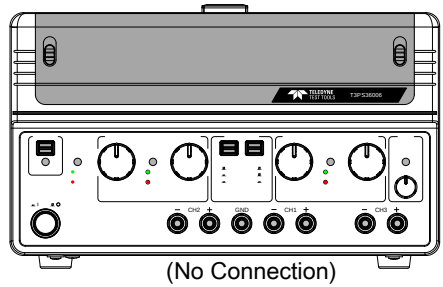
* Skip step 6 and 7 since Channel 3 does not have minimum current verification and Current knob.

OVP verification

Check item

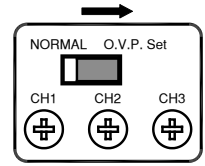
- OVP setting accuracy (Minimum)
- OVP functionality (Minimum)
- OVP setting accuracy (Maximum)
- OVP functionality (Maximum)

Connection

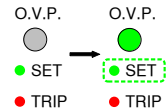


Verification step

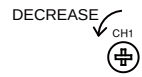
1. Set the T3PS36006 panel according to the Default setting list, page 45.
2. Power up the T3PS36006.
3. Set the OVP setting switch to the “O.V.P. SET” position.



4. The O.V.P. indicator on the front panel turns green.



5. Turn down the OVP setting terminal to minimum.



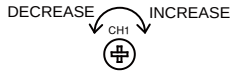
Minimum OVP setting

6. Record the T3PS36006 Voltage meter reading as the Minimum OVP setting accuracy. Here is the acceptance range.

Channel 1/2	≤ 1.0V

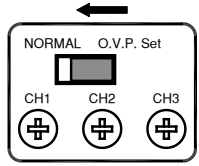
Channel 3	≤ 0.50V

7. Adjust the OVP setting terminal until the T3PS36006 meter shows the exact following value.

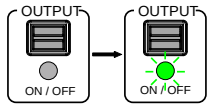


Channel 1/2	1.0V
Channel 3	0.50V

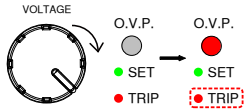
8. Set the OVP setting switch to the "Normal" position. The OVP indicator on the front panel turns Off.



9. Turn on the T3PS36006 output.



10. Slowly turn up the T3PS36006 Voltage knob until the OVP indicator turns red (tripped).

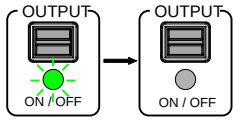


Minimum OVP functionality

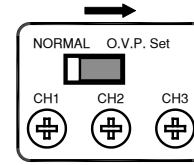
11. Record the T3PS36006 Voltage meter reading as the Minimum range OVP functionality. Here is the acceptance range.

Channel 1/2	0.5V ~ 1.5V
Channel 3	0.00V ~ 1.00V

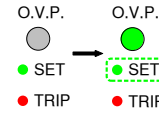
12. Turn off the T3PS36006's output.



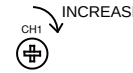
13. Set the OVP setting switch to the "O.V.P. SET" position.



14. The O.V.P. indicator on the front panel turns green.



15. Turn up the OVP setting terminal to maximum.



Maximum OVP setting

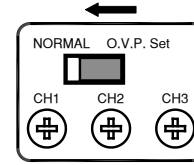
16. Record the T3PS36006 Voltage meter reading as the Maximum OVP setting accuracy. Here is the acceptance range.

Channel 1/2	65.0 ~ 68.0V
Channel 3	6.00 ~ 7.00V

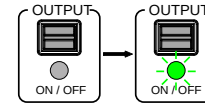
17. Adjust the OVP setting terminal until the T3PS36006 meter shows the exact following value.

Channel 1/2	60.0V
Channel 3	5.0V

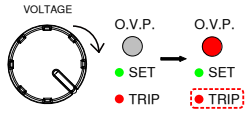
18. Set the OVP setting switch to the "Normal" position. The OVP indicator on the front panel turns Off.



19. Turn on the T3PS36006's output.



20. Slowly turn up the T3PS36006 Voltage knob until the OVP indicator turns red (tripped).

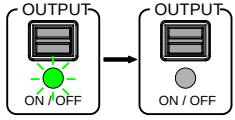


Maximum OVP functionality

21. Record the T3PS36006 Voltage meter reading as the Maximum range OVP functionality. Here is the acceptance range.

Channel 1/2	59.2V ~ 60.8V
Channel 3	4.47V ~ 5.53V

22. Turn off the T3PS36006's output.



23. Repeat step 3 to 22 for Channel 2.

24. Repeat step 3 to 22 for Channel 3.

Recording Tables

Output voltage verification (Minimum/Maximum)

Item	Channel	Min. limit	Result	Max. limit
Minimum Output Voltage	CH1	–30mV		0mV
	CH2	–30mV		0mV
	CH3	0mV		100mV
Maximum Output Voltage	CH1	61.5V		62.5V
	CH2	61.5V		62.5V
	CH3	5.2V		5.3V

Output voltage verification (Meter accuracy)

Tolerance = ± (0.5%*Multimeter +0.2) V

Channel	Multimeter	Tolerance	T3PS36006 (On)	T3PS36006 (Off)
Channel 1		~		
Channel 2		~		
Channel 3		~		

Tracking series voltage verification

Item	Channel	Min. limit	Result	Max. limit
Tracking Series Minimum	CH2	0.985V		1.015V
Tracking Series Maximum	CH2	59.69V		60.31V

Output current verification (Minimum/Maximum)

Item	Channel	Min. limit	Result	Max. limit
Minimum Output Current	CH1	–1mA		0mA
	CH2	–1mA		0mA
Maximum Output Current	CH1	6.15A		6.25A
	CH2	6.15A		6.25A
	CH3	3.05A		3.15A

Output current verification (Meter accuracy)

Tolerance = ± (0.5%*Multimeter +0.02) A

Channel	Multimeter	Tolerance	T3PS36006 (On)	T3PS36006 (Off)
Channel 1		~		
Channel 2		~		
Channel 3		~		

OVP verification

Item	Channel	Min. limit	Result	Max. limit
Minimum OVP Setting	CH1	0.0V		1.0V
	CH2	0.0V		1.0V
	CH3	0.0V		0.1V
Minimum OVP Functionality	CH1	0.5V		1.5V
	CH2	0.5V		1.5V
	CH3	0.00V		1.00V
Maximum OVP Setting	CH1	65.0V		68.0V
	CH2	65.0V		68.0V
	CH3	6.0V		7.0V
Maximum OVP Functionality	CH1	59.2V		60.8V
	CH2	59.2V		60.8V
	CH3	4.47V		5.53V

FAQ

Q1. I cannot turn on the output (the Output key does not respond).

A1. The following scenarios are possible.

- The rear panel remote control terminal is in the Off position. In this case, set it to the On position or deactivate remote control. For details, see page42.
- The OVP setting switch on the rear panel is on the SET side. In this case, set the switch to the Normal side.
- The OVP indicator is red. In this case, change the OVP setting to higher value or remove the over voltage condition.

Note that in several conditions, the Output key automatically turns Off to avoid harmful condition. For details, see page 26.

Q2. The CV/CC indicator is red (Constant Current) while the output is Off.

A2. This indicates there is an internal error. Contact the service center.

Q3. The meter does not match the real value.

A3. The following scenarios are possible.

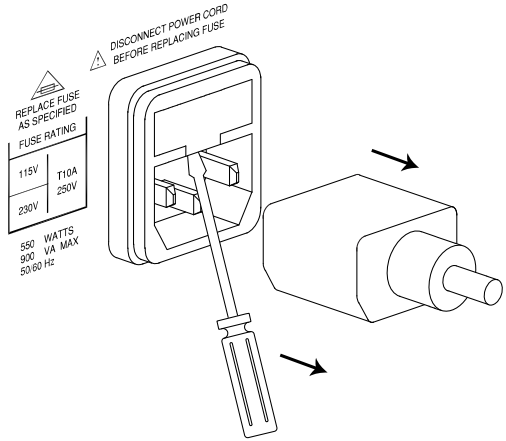
- Make sure the rear panel OVP setting is in the "Normal" position. If the OVP switch is in the "SET" position, the meter might show the OVP setting, not the output value. For OVP details, see page 23.
- If you are using Channel 1 or Channel 3, make sure the meter switch on the right side is in the correct position. Channel 1 and 3 share the same meter.

APPENDIX

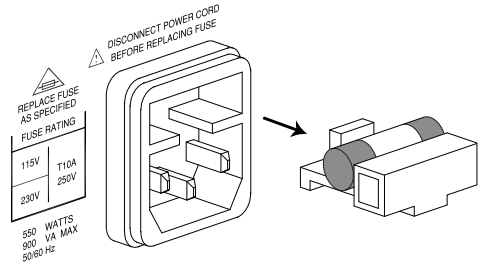
Fuse Replacement

Step

1. Take off the power cord and remove the fuse socket using a minus driver.



2. Replace the fuse in the holder.



Rating T10A/250V

Specification

Output Ratings	CH1/CH2 Independent	0 ~ 30V / 0 ~ 6A 0 ~ 60V / 0 ~ 3A
	CH1/CH2 Series	0 ~ 60V / 0 ~ 6A 0 ~ 120V / 0 ~ 3A
	CH1/CH2 Parallel	0 ~ 30V / 0 ~ 12A 0 ~ 60V / 0 ~ 6A
	CH3	0.1 ~ 5V / 3A
Voltage Regulation	Line	≤ 0.01% + 3mV
	Load	≤ 0.01%+ 5mV(rating current ≤ 6A) ≤ 0.01%+ 8mV(rating current ≤ 12A)
	Ripple & Noise	≤ 5mVrms (5Hz ~ 1MHz) ≤ 50mV$_{P-P}$ (20Hz ~ 20MHz)
	Recovery Time	≤ 100μs (50% load change, minimum load 0.5A)
Current Regulation	Line	≤ 0.2% + 3mA
	Load	≤ 0.2% + 3mA
	Ripple & Noise	≤ 3mArms
Tracking Operation	Tracking Error	≤ 0.5% + 10mV of Master
	Series Regulation	≤ 300mV
	Ripple & Noise	≤ 10mVrms (5Hz ~ 1MHz) ≤ 100mVpp (20Hz ~ 20MHz)
Output On/Off Response Time	Voltage Up (10% ~ 90%)	≤ 100ms (≤95% rating load)
	Voltage Down (90% ~ 10%)	≤ 100ms (≥10% rating load)
OVP	Accuracy	± (0.5% of reading + 0.5V)
Meter	Type	3 ½ digits 0.5" LED display
	Accuracy	± (0.5% of reading + 2 digits)

	Resolution	100mV/10mA
Insulation	Chassis and Terminal	100MΩ or above (DC 1000V)
	Chassis and AC cord	100MΩ or above (DC 1000V)
Temperature Coefficient	Voltage	≤ 100ppm/°C+3mV
	Current	≤ 150ppm/°C+3mA
Remote Control	Output On/Off	
Fan Noise	≤ 50dB	
Operation Environment	Ambient temperature 0 ~ 40°C Relative humidity ≤ 80%	
Storage Environment	Ambient temperature –10 ~ 70°C Relative humidity ≤ 70%	
Power Source	AC 115V/230V±15%, 50/60Hz	
Accessories	Quick Start Guide x 1, Power cord x 3 Test lead GTL-104A x 2, GTL-105A x 1	
Dimensions	255 (W) x 145 (H) x 265 (D) mm	
Weight	Approx. 6kg	

INDEX

ABOUT TELEDYNE TEST TOOLS

TELEDYNE TEST TOOLS
Everywhereyoulook™

Company Profile

Teledyne LeCroy is a leading provider of oscilloscopes, protocol analyzers and related test and measurement solutions that enable companies across a wide range of industries to design and test electronic devices of all types. Since our founding in 1964, we have focused on creating products that improve productivity by helping engineers resolve design issues faster and more effectively. Oscilloscopes are tools used by designers and engineers to measure and analyze complex electronic signals in order to develop high-performance systems and to validate electronic designs in order to improve time to market.

The Teledyne Test Tools brand extends the Teledyne LeCroy product portfolio with a comprehensive range of test equipment solutions. This new range of products delivers a broad range of quality test solutions that enable engineers to rapidly validate product and design and reduce time-to-market. Designers, engineers and educators rely on Teledyne Test Tools solutions to meet their most challenging needs for testing, education and electronics validation.

Location and Facilities

Headquartered in Chestnut Ridge, New York, Teledyne Test Tools and Teledyne LeCroy has sales, service and development subsidiaries in the US and throughout Europe and Asia. Teledyne Test Tools and Teledyne LeCroy products are employed across a wide variety of industries, including semiconductor, computer, consumer electronics, education, military/aerospace, automotive/industrial, and telecommunications.

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