

Programmable D.C. Electronic Load



PEL-3111

NEW



PEL-3041/3021

NEW



FEATURES

- * Operating Voltage (DC) : 1.5V~150V
- * Operating Mode : C.C./C.V./C.R./C.P./C.+C.V./C.R.+C.V./C.P.+C.V
- * Parallel Connection of Inputs for Higher Capacity (Max : 9,450W)
- * Support of High Slew Rate : Max 16A/μs
- * Run Program Function (Go/No Go Test)
- * Sequence Function for High Efficient Load Simulations
- * Commands are Compatible With Kikusui PLZ-4W Model (※)
- * Dynamic (Switching) Function : 0.0166Hz~20kHz
- * Soft Start Function : Off/On (1~200ms, Res : 1ms)
- * Adjustable OCP/OVP/OPP/UVP Setting
- * Short Circuit Function
- * Timer Function : Elapsed Time of Load on
- * Cut Off Time (Auto Load Off Timer) : 1s to 999h 59min 59s or Off
- * External Channel Control/Monitoring Via Analog Control Connector
- * Setup Memories : 100 sets
- * 3.5 Inch TFT LCD Display
- * Multi Interface : USB 2.0 Device/Host, RS-232C, GPIB (Optional)

The PEL-3000 Series, a single-channel, programmable D.C. electronic load with 0.01mA current resolution and 16A/μs current Slew Rate, is very ideal for testing server power supply and SPS (Switching Power Supply) for commercial and industrial computers. For a heavy-duty device like cloud ecosystem running 24-hour nonstop operations, a stable and high-power power supply, ranging from 350W to 1500W, is required to maintain the normal operation of server, Hub, and the equipment of data storage and internet communications. Owing to the increasing demand of data transmission and large scale data storage of telecommunications systems, the infrastructure of internet communications is in the pace of rapid expansion. This has greatly boosted the market demand of telecommunications equipment powered by power supply of 2000W and above. The flexible power combination of PEL-3000 meets the test requirements of present high-power power supply. With respect to battery testing applications such as rechargeable battery for electrical tools, battery module and automobile battery, PEL-3000 has three stand-alone models to offer including 175W, 350W, 1050W and 1050W. By connecting Booster 2100W units with master units, the maximum load capacity of the whole system can reach 9,450W. Hence, the PEL-3000 Series fulfills various power testing requirements including medium to low power or high-power power supply.

The PEL-3000 Series has seven operating modes and three operating functions. Among the seven operating modes, four of them are basic operating modes, including constant current, constant voltage, constant resistance, and constant power, and the other three are advanced operating modes including constant current + constant voltage, constant resistance + constant voltage, and constant power + constant voltage. Users must first select operating mode and then operating function based upon the test requirements. Static, Dynamic and Sequence operating functions can be applied to different testing conditions including a fixed load level, switching between two levels or switching among more than two levels. Sequence function is divided into Fast Sequence and Normal Sequence according to the test time of each step. Both Dynamic and Sequence are to assist users to simulate the genuine load change. For instance, PEL-3000 can simulate HEV current consumption to make sure that automobile battery can supply HEV with sufficient power need on the road. By so doing, manufacturers can elevate product quality and reliability.

The adjustable high speed Slew Rate of 16A/μs simulates rise and fall speed of different load current so as to test the adequacy of the Response time of power supply. The Soft Start function of the PEL-3000 Series can set current rise time for the moment PEL-3000 is turned on to reduce the abnormal situation of the voltage drop of power supply under test. The adjustable Under Voltage Protection (UVP), Go/NoGo voltage input monitoring function, current monitoring function and Timer Function to control load activation time can be jointly applied to the characteristic tests of battery bleading to avoid battery damage during bleading operation. Based upon the functionalities described above, the PEL-3000 Series can test a vast variety of power supply ranging from the fundamental static sink current to complex dynamic load simulations so as to enhance product quality and reliability.

The PEL-3000 Series D.C Electronic Load

The PEL-3000 Series is a high speed, single channel and programmable D.C. electronic load and its power, functionality, parallel combination and size are listed on the following chart :

MODEL	PEL-3021	PEL-3041	PEL-3111	PEL-3211
Power	175W	350W	1,050W	2,100W Booster
Function	Full-function Single Unit	Full-function Single Unit	Full-function Single Unit	No control panel, can not be operated alone
Parallel Combination	Parallel with same model, 5 units the maximum	Parallel with same model, 5 units the maximum	Parallel with same model, 5 units the maximum	Parallel with PEL-3111
			Parallel with the maximum of four PEL-3211s	
Size	Half Rack	Half Rack	Full Rack	Full Rack

SPECIFICATIONS						
Model	PEL-3021		PEL-3041	PEL-3111	PEL-3211	
Voltage	1.5V~150V		1.5V~150V	1.5V~150V	1.5V~150V	
Current	0~35A		0~70A	0~210A	0~420A	
Power	175W		350W	1050W	2100W	
CONSTANT CURRENT MODE						
Operating Range	0~35A 0~3.5A 0~0.35A		A~70A A~7A A~0.7A	A~210A A~21A A~2.1A	420A	
Accuracy of Setting	H, M, L		±(0.2% of set + 0.1% of f.s.) + Vin ² /500kΩ		±(1.2% of set + 1.1% of f.s.)	
Accuracy of Setting(Parallel)	H, M, L		±(1.2% of set + 1.1% of f.s.)			
Resolution	1mA 0.1mA 0.01mA		2mA 0.2mA 0.02mA	10mA 1mA 0.1mA	N/A	
CR MODE						
Operating Range	Range	H	23.3336S~400μS (42.857mΩ~2.5kΩ)	46.6672S~800μS (21.428mΩ~1.25kΩ)	140.0016S~2.4mS (7.1427mΩ~41.6667kΩ)	28.0002S~484.8us (35.7135mΩ~2.08334kΩ)
		M	2.33336S~40μS (428.566mΩ~25kΩ)	4.6667S~80μS (214.28mΩ~12.5kΩ)	14.0001S~242.4μS (71.427mΩ~4.16667kΩ)	
		L	0.233336S~4μS (4.28566kΩ~250kΩ)	0.46667S~8μS (2.1428kΩ~125kΩ)	1.40001S~24.24μS (71.427mΩ~41.6667kΩ)	
Accuracy of Setting	H, M, L		±(0.5% of set + 0.5% of f.s.) + Vin ² /500kΩ		±(1.2% of set + 1.1% of f.s.)	
Resolution	400μS 40μS 4μS		800μS 80μS 8μS	2.4mS 240μS 24μS	N/A	
CONSTANT VOLTAGE MODE						
Operating Range	Range	H	1.5V~150V		1.5V~150V	
		L	1.5V~15V		1.5V~15V	
Accuracy of Setting	H, L		±(0.1% of set + 0.1% of f.s)		N/A	
Resolution	H, L		10mV/1mV		N/A	
CONSTANT POWER MODE						
Operating Range	Range	H	17.5W~175W	35W~350W	105W~1050W	210W~2100W
		M	1.75W~17.5W	3.5W~35W	10.5W~105W	21W~210W
		L	0.175W~1.75W	0.35W~3.5W	1.05W~10.5W	2.1W~21W
Accuracy of Setting	H, M, L		±(0.6% of set + 1.4% of f.s.)			
Resolution	10mW 1mW 0.1mW		10mW 1mW 0.1mW	100mW 10mW 1mW		
PARALLEL Mode						
Capacity	875W		1750W	5250W	PEL3111 with 4 booster units : Max 9,450W	
SLEW RATE						
Setting Range (CC mode)	Range	H	2.5mA/μs~2.5A/μs	5mA/μs~5A/μs	16mA/μs~16A/μs	16mA/μs~16A/μs
		M	250μA/μs~250mA/μs	500μA/μs~500mA/μs	1.6mA/μs~1.6A/μs	1.6mA/μs~1.6A/μs
		L	25μA/μs~25mA/μs	50μA/μs~50mA/μs	160μA/μs~160mA/μs	N/A
Setting Range (CR Mode)	Range	H	250μA/μs~250mA/μs	500μA/μs~500mA/μs	1.6mA/μs~1.6A/μs	1.6mA/μs~1.6A/μs
		M	25μA/μs~25mA/μs	50μA/μs~50mA/μs	160μA/μs~160mA/μs	160μA/μs~160mA/μs
		L	2.5μA/μs~2.5mA/μs	5μA/μs~5mA/μs	16μA/μs~16mA/μs	N/A
Accuracy of Setting	H, M, L		±(10% of set + 5μs)		N/A	
Resolution	0.1μA ~ 1mA		0.2μA ~ 2mA	0.6μA ~ 6mA	N/A	
METER						
Voltmeter Accuracy	Accuracy	±(0.1% of rdg + 0.1% of f.s)				
		±(0.2% of rdg + 0.3% of f.s.)				
Ammeter Accuracy	Accuracy	±(0.2% of rdg + 0.3% of f.s.)				
		±(1.2% of rdg + 1.1% of f.s.)				
DYNAMIC MODE						
Operation Mode T1 & T2 Accuracy	CC and CR 0.025mS~10mS/Res : 1μs ; 1ms~30s/Res : 1ms 1μS/1ms ± 100ppm					
Slew Rate	Range	H	2.5mA/μs~2.5A/μs	5mA/μs~5A/μs	16mA/μs~16A/μs	16mA/μs~16A/μs
		M	250μA/μs~250mA/μs	500μA/μs~500mA/μs	1.6mA/μs~1.6A/μs	1.6mA/μs~1.6A/μs
		L	25μA/μs~25mA/μs	50μA/μs~50mA/μs	160μA/μs~160mA/μs	N/A
Current Accuracy	±0.4%F.S.					
PROTECTION FUNCTION						
Overvoltage protection(OVP)	Adjustable ; Turns off the load at 110% of the rated voltage					
Overcurrent protection(OCP)	0.03A~38.5A(Adjustable) 0.06A~77A(Adjustable) 0.2A~231A(Adjustable)					
Overpower protection(OPP)	0.1W~192.5W(Adjustable) 0.3W~385W(Adjustable) 1W~1155W(Adjustable)					
Overheat protection(OHP)	Turns off the load when the heat sink temperature reaches 95 °C					
Undervoltage protection(UVP)	Adjustable ; Turns off the load when detected					
Reverse connection protection(REV)	Can be set in the range of 0 V to 150 V or Off					
	By diode. Turns off the load when an alarm occurs.					
POWER SOURCE						
AC100V ~ 230V±10% ; 50Hz / 60Hz ± 2Hz						
INTERFACE						
USB/RS232/Analog Control (Standard) ; GPIB(Optional)						
DIMENSIONS & WEIGHT						
	214.5 (W) x 124 (H) x 400 (D) mm ; Approx. 6kg	214.5 (W) x 124 (H) x 400 (D) mm ; Approx. 7kg	429.5 (W) x 128 (H) x 400 (D) mm ; Approx. 17kg	427.7 (W) x 128 (H) x 592.5 (D) mm ; Approx. 23kg		

Rear Panel



GTL-255 Frame Link Cable (300mm)



GTL-120 Test Lead



GRA-413 Rack Mount Kit (EIA+JIS)

For : PEL-3211



GRA-414-J Rack Mount Kit (JIS)

For : PEL-3021/3041/3111



GRA-414-E Rack Mount Kit (EIA)

For : PEL-3021/3041/3111



Programmable D.C. Electronic Load

SPECIFICATIONS									
Model	PEL-3212	PEL-3323	PEL-3424	PEL-3535	PEL-3322	PEL-3533	PEL-3744	PEL-3955	
Voltage	1.5V-150V	1.5V-150V	1.5V-150V	1.5V-150V	1.5V-150V	1.5V-150V	1.5V-150V	1.5V-150V	
Current	0-420A	0-630A	0-840A	0-840A	0-1050A	0-1050A	0-1470A	0-1890A	
Power	2100W	3150W	4200W	5250W	3150W	5250W	7350W	9450W	
CONSTANT CURRENT MODE									
Operating Range	0-420A	0-630A	0-840A	0-840A	0-1050A	0-1050A	0-1470A	0-1890A	N/A
Accuracy of Setting	H,M,L $\pm(0.2\% \text{ of set} + 0.1\% \text{ of f.s.}) + \text{Vin}^2/500\text{K}\Omega$								
Resolution	20mA	30mA	40mA	50mA	30mA	50mA	70mA	90mA	N/A
CR MODE									
Operating Range	H 280.0032S-4.8mS (3.57138m Ω - 208.333 Ω)	M 420.0048S-7.2mS (2.38092m Ω - 138.888 Ω)	L 560.0064S-9.6mS (1.78569m Ω - 104.166 Ω)	700.008S-12mS (1.42855m Ω - 83.333 Ω)	420.0048S-7.2mS (2.38092m Ω - 138.888 Ω)	700.008S-12mS (1.42855m Ω - 83.333 Ω)	980.0112S-16.8mS (1.02039m Ω - 59.5238 Ω)	1260.0144S-21.6mS (793.641m Ω - 46.2963 Ω)	N/A
Accuracy of Setting	H,M,L $\pm(0.5\% \text{ of set}^* + 0.5\% \text{ of f.s.}) + \text{Vin}^2/500\text{K}\Omega$								
Resolution	4.8mS	480 μ S	48 μ S	7.2mS	720 μ S	72 μ S	1.2mS	12mS	1.2mS
CONSTANT VOLTAGE MODE									
Operating Range	H 1.5V-150V L 1.5V-15V								
Accuracy of Setting	H,L $\pm(0.1\% \text{ of set} + 0.1\% \text{ of f.s.})$								
Resolution	H,L 10mV/1mV								
CONSTANT POWER MODE									
Operating Range	H 210W-2100W	M 315W-3150W	L 420W-4200W	525W-5250W	315W-3150W	525W-5250W	735W-7350W	945W-9450W	
Accuracy of Setting	H,M,L $\pm(0.6\% \text{ of set} + 1.4\% \text{ of f.s.})$								
Resolution	200mW	20mW	2mW	300mW	30mW	3mW	400mW	40mW	4mW
PARALLEL MODE									
Capacity	-								
SLEW RATE									
Setting Range (CC mode)	H 32mA/ μ S-16A/ μ S	M 48mA/ μ S-16A/ μ S	L 64mA/ μ S-16A/ μ S	80mA/ μ S-16A/ μ S	48mA/ μ S-16A/ μ S	80mA/ μ S-16A/ μ S	112mA/ μ S-16A/ μ S	144mA/ μ S-16A/ μ S	
Resolution	1.2 μ A-12mA	1.8 μ A-18mA	2.4 μ A-24mA	3 μ A-30mA	1.8 μ A-18mA	3 μ A-30mA	4.2 μ A-42mA	5.4 μ A-54mA	
Setting Range (CR Mode)	H 3.2mA/ μ S-1.6A/ μ S	M 4.8mA/ μ S-1.6A/ μ S	L 6.4mA/ μ S-1.6A/ μ S	8mA/ μ S-1.6A/ μ S	4.8mA/ μ S-1.6A/ μ S	8mA/ μ S-1.6A/ μ S	11.2mA/ μ S-1.6A/ μ S	14.4mA/ μ S-1.6A/ μ S	
Resolution	120nA-1.2mA	180nA-1.8mA	240nA-2.4mA	300nA-3.0mA	180nA-1.8mA	300nA-3.0mA	4.2nA-4.2mA	5.4nA-5.4mA	
Accuracy of Setting	H,M,L $\pm(10\% \text{ of set}^* + 5\mu$ S)								
METER									
Voltmeter Accuracy	$\pm(0.1\% \text{ of rdg} + 0.1\% \text{ of f.s.})$								
Ammeter Accuracy	$\pm(0.2\% \text{ of rdg} + 0.3\% \text{ of f.s.})$								
DYNAMIC MODE									
Operation Mode	CC and CR 0.025mS-10mS/Res: 1 μ S; 1mS-30S/Res: 1mS								
T1 & T2 Accuracy	1 μ S/1ms \pm 100ppm								
Slew Rate (CC Mode)	H 32mA/ μ S-16A/ μ S	M 48mA/ μ S-16A/ μ S	L 64mA/ μ S-16A/ μ S	80mA/ μ S-16A/ μ S	48mA/ μ S-16A/ μ S	80mA/ μ S-16A/ μ S	112mA/ μ S-16A/ μ S	144mA/ μ S-16A/ μ S	
Slew Rate (CR Mode)	H 3.2mA/ μ S-1.6A/ μ S	M 4.8mA/ μ S-1.6A/ μ S	L 6.4mA/ μ S-1.6A/ μ S	8mA/ μ S-1.6A/ μ S	4.8mA/ μ S-1.6A/ μ S	8mA/ μ S-1.6A/ μ S	11.2mA/ μ S-1.6A/ μ S	14.4mA/ μ S-1.6A/ μ S	
Current Accuracy	$\pm 0.4\%$ F.S.								
PROTECTION FUNCTION									
Overvoltage protection(OVP)	Adjustable; Turns off the load at 110% of the rated voltage								
Overcurrent protection(OCP)	0.4A-462A(Adjustable)	0.6A-693A(Adjustable)	0.8A-924A(Adjustable)	1.0A-1155A(Adjustable)	0.6A-693A(Adjustable)	1.0A-1155A(Adjustable)	1.4A-1617A(Adjustable)	1.8A-2079A(Adjustable)	
Overpower protection(OOP)	2W-210W(Adjustable)	3W-345W(Adjustable)	4W-4620W(Adjustable)	5W-5775W(Adjustable)	3W-345W(Adjustable)	5W-5775W(Adjustable)	7W-8085W(Adjustable)	9W-10395W(Adjustable)	
Overheat protection(OHP)	Turns off the load when the heat sink temperature reaches 95 °C								
Undervoltage protection(UVP)	Adjustable: Turns off the load when detected Can be set in the range of 0V to 150V or Off								
Reverse connection protection(REV)	By diode. Turns off the load when an alarm occurs								

SPECIFICATIONS								
Model	PEL-3212	PEL-3323	PEL-3424	PEL-3535	PEL-3322	PEL-3533	PEL-3744	PEL-3955
POWER SOURCE								
AC100V ~ 230V \pm 10%; 47Hz ~ 63Hz								
INTERFACE								
USB/RS232/Analog Control (Standard); GPIB(Optional)								
DIMENSIONS & WEIGHT								
	598(W)x611(H)x 706(D)mm; Approx. 67.5kg	598(W)x611(H)x 706(D)mm; Approx. 85.5kg	598(W)x877(H)x 706(D)mm; Approx. 110kg	598(W)x877(H)x 706(D)mm; Approx. 127.5kg	598(W)x611(H)x 706(D)mm; Approx. 73kg	598(W)x611(H)x 706(D)mm; Approx. 96.5kg	598(W)x877(H)x 706(D)mm; Approx. 125kg	598(W)x877(H)x 706(D)mm; Approx. 149kg

ORDERING INFORMATION	
PEL-3021 175W Programmable DC Electronic Load	PEL-3424 4200W Programmable DC Electronic Load
PEL-3041 350W Programmable DC Electronic Load	PEL-3535 5250W Programmable DC Electronic Load
PEL-3111 1050W Programmable DC Electronic Load	PEL-3322 3150W Programmable DC Electronic Load
PEL-3211 2100W Booster unit for PEL-3111 only	PEL-3533 5250W Programmable DC Electronic Load
PEL-3212 2100W Programmable DC Electronic Load	PEL-3744 7350W Programmable DC Electronic Load
PEL-3323 3150W Programmable DC Electronic Load	PEL-3955 9450W Programmable DC Electronic Load
ACCESSORIES :	
User Manual x 1, Power Cord (depend on model number), Protection cover, Insulation sheet, GTL-255 Frame Link Cable (for PEL-3211/3212/3323/3424/3535/3322/3533/3744/3955)	
OPTIONAL ACCESSORIES	
CTL-120 Test Lead (Max 40A)	GRA-413 Rack Mount Kit (EIA+JIS) for PEL-3211
CTL-248 GPIB Cable (2m)	GRA-414-J Rack Mount Kit (JIS) for PEL-3021/3041/3111
CTL-246 USB Cable, USB 2.0A-B TYPE CABLE, 4P	GRA-414-E Rack Mount Kit (EIA) for PEL-3021/3041/3111
GTL-251 GPIB-USB-HS (High Speed)	PEL-004 GPIB Card
GTL-255 Frame Link Cable (300mm)	PEL-010 Dust filter
FREE DOWNLOAD	
Driver	LabView Driver

- *1. Full scale of H range.
- *2. Vin: input terminal voltage of electronic load.
- *3. M range applies to the full scale of H range.
- *4. Set = Vin/Rset.
- *5. It is not applied for the condition of the parallel operation.
- *6. M range applies to the full scale of H range.
- *7. Time to reach from 10 %~90 % when the current is varied from 2 %~100 % (20 %~100 % in M range) of the rated current.



PEL-3000 Series

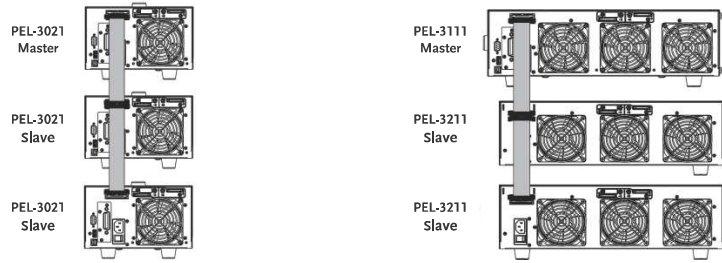
ELECTRONIC LOAD

PEL-3000 Series

ELECTRONIC LOAD

Programmable D.C. Electronic Load

A. OPERATING FUNCTION FOR MASTER AND SLAVE IN PARALLEL



Three PEL-3021 in Parallel

One PEL-3111 connects with two PEL-3211 in Parallel

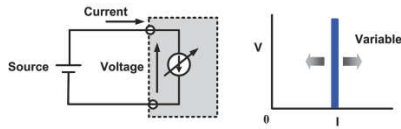
PEL-3000 Series connects with loads via MIL 20-pin interface and connecting cables to designate a master to control other slave units in parallel. One PEL-3111 and four PEL-3211s in parallel provide the maximum power of 9,450W. Parallel arrangement

allows users to flexibly select and apply different power arrangement which enhances equipment utilization efficiency to save R&D cost.

B. OPERATING MODE

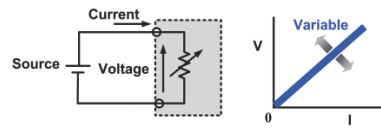
The PEL-3000 series provides four fundamental operating modes and three add-on modes of CC, CR and CP separately combining with CV. Users can set different load condition under different operating modes such as setting operating range for load level, Current Slew Rate, input voltage and load current. The input

voltage range has two levels - high and low. The load current operating range has three levels - high, medium and low current levels which possess different resolution to meet test requirements of different power product specifications.



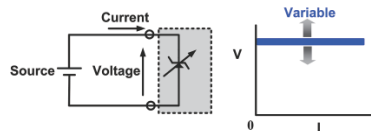
CC Mode

Under constant current mode, electronic load will sink the amount of current users has set. Different current settings via CC mode allow users to test the voltage changes of DC power supply which is called load regulation rate test.



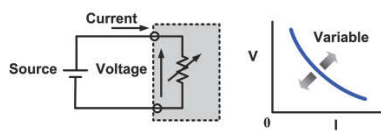
C.R Mode

Under constant resistance mode, electronic load will sink load current, which is linearly direct proportion to input voltage. This mode can be utilized in testing voltage or the activation and current limit of power supply.



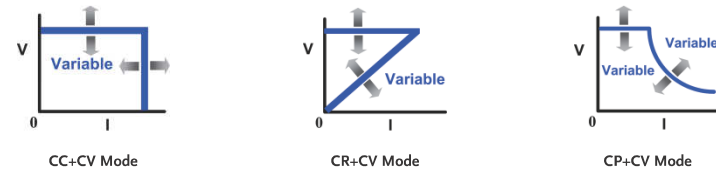
C.V Mode

Under constant voltage mode, electronic load will sink sufficient current to regulate the voltage source to the set value. This mode allows users not only to test current limit function of power supply, but also to simulate battery operation in testing battery chargers.



C.P Mode

Under constant power mode, electronic load will sink load current, which is indirect proportion to input voltage to reach preset constant power requirement. Hence, the changes of input voltage will have indirect proportion effect on current sinking so as to reach constant power control.



+CV mode can be selected under CC, CR or CP mode. When +CV mode function is turned on and electronic load sinks more current than the maximum current of power supply under test, electronic load will automatically switch to CV mode. It is because that the current sunk is the maximum current of power device. Therefore,

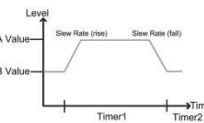
power supply will switch to CC mode and PEL-3000 will switch to CV mode to limit electronic load from sinking the total current of power supply so as to prevent power supply under test from damaging. Electronic load will cease operation once the voltage of DUT is lower than the set voltage under +CV mode.

C. THREE OPERATING FUNCTIONS

The PEL-3000 series, according to different test conditions, step or continuous changes, test speeds, and selectable modes, has three operating functions: Static, Dynamic and Sequence, which can be separately applied on a fixed load test; between two loads; or among more than two loads. Detailed descriptions of these functions are as follows:

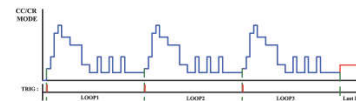
Static function provides a fixed load to test output stability of power supply. Switching load value A to B will be manually operated. Under Dynamic function, two test conditions can be switched automatically and every set of parameter includes Level, Timer and Slew Rate. Timer can be set to the fastest of 25μs to accommodate response time of different power supply and assist testing power supply output status when load is unstable in order to enhance products' reliability and quality.

Function	Operation	Static	Dynamic	Sequence	
				Fast	Normal
Operating Condition Selection	Single fixed condition	Selection between two conditions	Selection among more than two conditions	Selection from more than two conditions	Selection from more than two conditions
Operating Modes	All modes	• Two conditions using same mode • CR, CC, CP modes	• Each condition must use same mode • Support CC or CR mode	• Each condition using different mode • All modes	• Each condition using different mode • All modes
Adjustable Condition Setting	• A/B Value • Slew Rate	• Level 1/Level 2 • Timer 1/Timer 2 • Slew Rate 1/Slew Rate 2	• Level • Timer • Slew Rate	• Others...	• Level • Timer • Slew Rate • Others...
Sequence Step Combination	N/A	N/A	• 1 Sequence • 1,000 steps	• 25μs/step	• 10 Sequence • 1,000 steps • 1ms/step
Other Functions	N/A	N/A	• Trigger Out function		• Trigger Out function • Ramp function



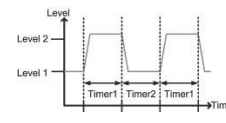
Static Mode

In Sequence function, waveforms of load current edited by Fast Sequence are steps and every step can reach the fastest of 25μs



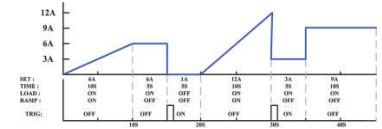
Fast Sequence Diagram

Normal Sequence provides RAMP function to users, according to their requirements, to select between slope and step method under set time to sink current.



Dynamic Mode

to provide the high slew rate for electronic loads.



Normal Sequence Diagram

By applying a complete sequence editing function, users can control electronic load without using a computer or writing a program so as to save cost and time of R&D.

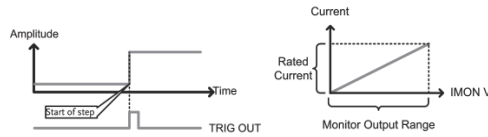
Programmable D.C. Electronic Load

D. TRIGGER SIGNAL AND CURRENT MONITORING (IMON)



BNC connectors on the front panel

The front panel of PEL-3000, via BNC connectors provides two output signals, which are Trigger Signal and IMON. Under Dynamic or Sequence function, the moment the load current setting is changed BNC on the front panel will output a 4.5V and 2us pulse voltage. This trigger signal can be set to open or close for every step. Users can use trigger signal to synchronize other devices inside the system.

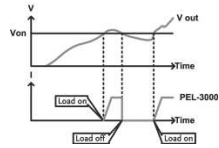


TRIG OUT = ON

IMON OUTPUT

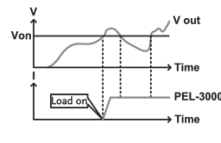
Current monitoring signals, using a BNC connector to compare with the full scale of real load current, output 0 ~ 1V at high and low current levels and 0 ~ 0.1V at medium current level. Therefore, users can monitor load current change without using current probe to save cost.

E. VON VOLTAGE AND VON LATCH FUNCTION



Von Latch = OFF

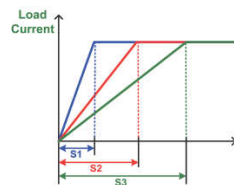
Von Voltage is the threshold voltage for electronic load to activate or terminate sinking current. When Von Latch is set to off, electronic load operation will be activated if input voltage is higher than Von Voltage and electronic load operation will be terminated if input voltage is lower than Von Voltage. When Von



Von Latch = ON

Latch is set to on, electronic load operation will be activated if input voltage is higher than Von Voltage and will continue operation even input voltage is lower than Von Voltage. Von Voltage function can test the transient maximum current capability provided by power supply.

F. SOFT START



Three different load waveforms of Soft Start Time

Soft Start regulates the time of current rising from 0 to preset value during the moment load is activated. This function is to prevent voltage from dropping due to the fast transient rising

speed of load current. Sudden voltage drop will result in an unsuccessful activation of electronic load or DUT and a damaged DUT.

G. PROTECTION MODES

Functions	Protection	OCP	OVP	OPP	OTP	UVP
Adjustable Thresholds		✓	✓	✓	Fixed	✓
Load Off		✓	✓	✓	N/A	✓
Limit Function		✓	N/A	✓	N/A	N/A

The PEL-3000 Series provides many protective functions including over current protection (OCP), over voltage protection (OVP), over power protection (OPP), over temperature protection (OTP) and under voltage protection (UVP). Except for OTP, all thresholds of protective functions are adjustable. When protective function is activated, electronic load will send out warning signal and terminate operation. Other than protective functions, Limit

function can also be utilized to maintain electronic load in operation at a preset value. The related settings and selections are as follows: Take UVP as an example. In battery bleeding tests, electronic load will cease operation if battery voltage is lower than the set protective threshold value in order to prevent battery from over bleeding.

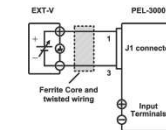
H. ANALOG CHANNEL CONTROL



Rear Panel of PEL-3111



Rear Panel of PEL-3021/PEL-3041



External Voltage Connection

The PEL-3000 Series provides the external analog channel control function, which allows users to connect J1 and J2 MIL 20 pin standard connectors on the rear panel to input voltage or to connect resistance to control electronic load operation. Input voltage is limited to the range of 0 ~ 10V; connecting resistance

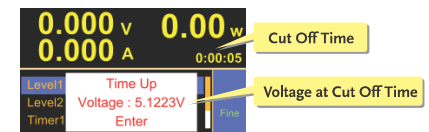
is limited to the range of 0Ω ~ 10kΩ; and related to load level are 0~100%. For instance, when operating PEL-3021 under CC mode and 35A, external input voltage is 1V and sink current is 3.5A. Users can integrate this function into test system and utilize signals generated from the test system to control PEL-3000 Series.

I. TIMER FUNCTIONS



Elapsed Time

The PEL-3000 series provides count time and cut off time functions. The display screen will show present activation time when electronic load is activated. When electronic load operation is terminated count time will stop and the total operation time will be shown on the display screen. The activation time of cut off time can be set to the maximum length of 999h 59min 59s. When electronic load is activated

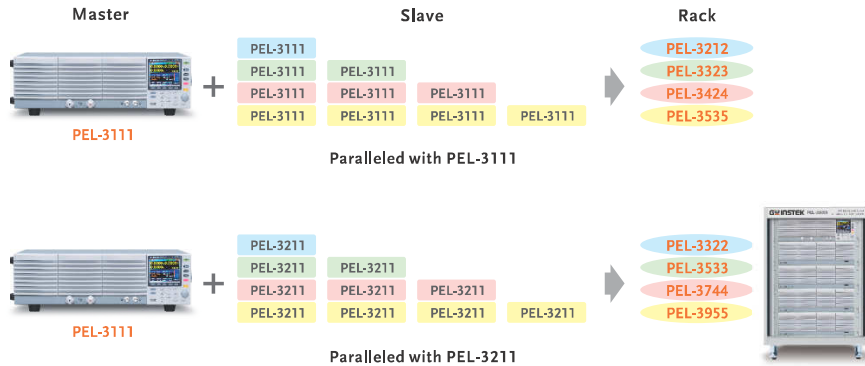


Voltage at Cut Off Time

this function will start counting time. Electronic load will cease operation (load off) and show the final input voltage on the screen when preset time is reached. Timer function can provide information and application related to time. Users can obtain the total time of limiting electronic load operation to increase the agility of electronic load tests.

Programmable D.C. Electronic Load

J. MASTER/SLAVE PARALLEL CONTROL:



PEL-3111 can be used as either master or Slave. PEL-3111 can also be connected in parallel with PEL-3211 (Booster unit). Customers, based upon their DUT requirements, can collocate different models to meet their power requirements. The system collocation connection and terminals are all copper bar structure. System Rack is also available. When the Master/Slave control mode is selected, Master will automatically calculate current sunk as soon as load has been activated. The system will automatically

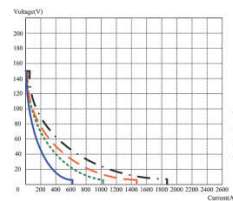
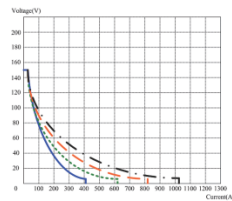
distribute current to each Master/Slave unit. For Master/Slave parallel collocation, users only enter settings and edit programs on Master. Logically speaking, Master/Slave parallel collocation can be regarded as one single load unit. Therefore, this collocation can safely provide load capacity with actual current and power in the respective level. Parallel collocation can also meet different current and power requirements.

K. RACK MODEL COLLOCATION AND RATED POWER

Model	PEL-3322	PEL-3533	PEL-3744	PEL-3955
Watt	3150W	5250W	7350W	9450W
Current	0-630A	0-1050A	0-1470A	0-1890A
Collocation	PEL-3111+PEL-3211	PEL-3111+PEL-3211 x 2	PEL-3111+PEL-3211 x 3	PEL-3111+PEL-3211 x 4

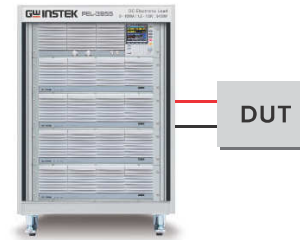
Model	PEL-3212	PEL-3323	PEL-3424	PEL-3535
Watt	2100W	3150W	4200W	5250W
Current	0-420A	0-630A	0-840A	0-1050A
Collocation	PEL-3111 x 2	PEL-3111 x 3	PEL-3111 x 4	PEL-3111 x 5

L. RACK MODEL POWER LOAD CHARACTERISTICS (TYPICAL)

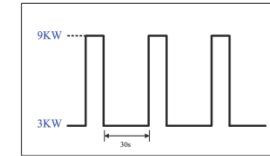


M. SUCCESSFUL CASE OF HIGH POWER MODEL IN PARALLEL:

Load's Waveform Shown on Right Diagram :



Connection Diagram of Application



Example the Waveform of Load

Some large power supply system has a stable load of 3kW under the normal duty operation and its dynamic load of transient peak will reach 9kW. This system uses PEL-3955 to simulate load patterns so as to assist engineers in analyzing and testing DUT. The procedures:

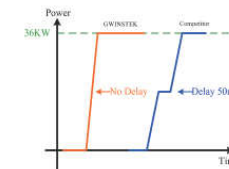
- * Select load mode as CC or CP
- * Select appropriate operational level: I Range/V Range ≥ High
- * Select operational mode as Dynamic mode or Sequence
- * Set related load arguments sequentially Level1, Level2, Slew Rate and Duration Time
- * If Sequence is selected, each segment's load condition must be set according to users' requirements
- * Execute load operation

N. HIGH POWER MODEL AUGMENTATION AND PARALLEL

To meet customers' larger sink current, larger power and flexible application of electronic load requirements, the design concept of the PEL-3000 series not only meets the requirement of low power products with high resolution, but also supports the measurement of high power and large current. Single unit of the series can satisfy various load conditions. For higher power

requirements, users can consider purchasing additional Slave control system to collocate the system in parallel through system connection. For operating PEL-3955 (1.5~150V/1890A/9.45kW), six units of PEL-3955 are arranged in parallel to reach load capacity of 56.7kW. Bus bar connection can guarantee the safety of large power and large current operations.

O. LARGER POWER MODEL DYNAMIC SYNCHRONIZATION CONTROL



Waveform of power load

To ensure each Rack can execute synchronized parallel load operation and to simulate the real dynamic load operation. The orange curve of the above diagram shows PEL-3955 executing dynamic synchronized control under external parallel. Comparing with other electronic loads in parallel, the PEL-3000 series does not delay. PEL-3955, with its superior performance and distinct characteristics, has been widely used as test and verification

equipment in the power test field. In addition to single unit electronic load of 1kW, larger power models have power outputs including 3kW/5kW/7kW/9kW/18kW/27kW/36kW/54kW, which provide the most important test and verification platform for R&D and QA in the fields of server power system, communications power system, hybrid power pack, solar power module.