Programmable DC Electronic Load
PEL-2000A Series

USER MANUAL

Table of Contents

SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow when operating the PEL-2000A series, and when keeping it in storage. Read the following before operating the PEL-2000A series to ensure your safety and to keep the PEL-2000A series in the best possible condition.

Safety Symbols

These safety symbols may appear in this manual or on the PEL-2000A series.

⚠ 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 the PEL-2000A series or to other properties.
⚡	DANGER High Voltage
⚠	Attention Refer to the Manual
⏚	Protective Conductor Terminal
⏛	Earth (ground) Terminal
♻	Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.

Safety Guidelines

General
Guideline

⚠ CAUTION

- Do not place any heavy object on the PEL-2000A series.

- Avoid severe impact or rough handling that leads to damaging the PEL-2000A series.

- Do not discharge static electricity to the PEL-2000A series.

- Do not block or obstruct the cooling fan vent openings.

- Do not perform measurement at circuits directly connected to Mains (Note below).

- Do not disassemble the PEL-2000A series unless you are qualified as service personnel.

- The equipment is not for measurements performed for CAT II, III and IV.

(Measurement categories) EN 61010-1 specifies the measurement categories and their requirements as follows. The PEL-2000A series 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 range: 100-120Vac/ 200-240Vac (90-132Vac/ 180-250Vac)
  Frequency: 47~63Hz
  Power rating: PEL-2004A: 250VA Max
                      PEL-2002A: 150VA Max

- Connect the protective grounding conductor of the AC power cord to an earth ground, to avoid electrical shock.

Fuse	• Fuse type: T3.15A/250V
⚠ WARNING	• Make sure the correct type of fuse is installed before power up.
	• To avoid fire, only replace the fuse with the specified type and rating.
	• Disconnect the power cord before fuse replacement.
	• Make sure the cause of a fuse blowout is fixed before replacing the fuse.
Cleaning the PEL-2000A	• 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 chemicals or cleaners 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)
	• Temperature: 0°C to 40°C
	• Altitude: Up to 2000m
	• Transient Overvoltage on the main supply is 2500V.

(Pollution Degree) EN 61010-1 specifies the pollution degrees and their requirements as follows. The PEL-2000A series 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: < 80%
	• Temperature: −10°C to 70°C
Disposal	Do not dispose this instrument as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. Please make sure discarded electrical waste is properly recycled to reduce environmental impact.

GETTING STARTED

This chapter describes the features and functions of the
PEL-2000A series, including the front and rear panel
appearance, panel installation and connection types. Use
the Tutorial section for quick access to step by step
instructions on the main functions.

Main Features

Description   The PEL-2002A and PEL-2004A are multichannel
                programmable DC electronic load mainframes.
                The PEL-2002A mainframe is able to hold 2 load
                modules, whilst the PEL-2004A is able to hold 4.
                The flexible module configuration allows the
                mainframes to either sink multiple loads
                independently or large loads when used in
                parallel.

                The PEL-2000A series support four operation
                modes: constant current (CC), constant voltage
                (CV and CV+CC), constant resistance (CR) and
                constant power (CP). Constant current and
                constant resistance mode can operate in either
                static or dynamic mode.

Feature Overview • Flexible operation with removable load
                   modules.

                 • Multiple independent isolated channels.

                 • High performance, up to 5 digit resolution.

                 • High slew rate enabling a high response speed

                 • High capacity when frame linked.

                 • Different load module types can be used in the
                   same mainframe.

                 • Dedicated parallel mode.

                 • Supports rack mount installation.

                 • Supports frame link connections, with up to 4
                   slave units.

                 • Color LCD display.

                 • 120 different sets of programmable sequences.

                 • Accurate load simulation using Sequences.

- 4 panel setups.

- USB flash drive support.

Interface
- USB

- RS-232C

- LAN (optional)

- GPIB (optional)

Series Overview

The PEL-2000A series comprises of two different Mainframes: the PEL-2002A and the PEL-2004A. The Mainframes differ by the number of load modules that can be accommodated. The PEL-2002A has two load module slots whilst the PEL-2004A has 4. There are 8 different load module models, the PEL-2020A, PEL-2030A, PEL-2040A and PEL-2041A, PEL-2020B, PEL-2030B, PEL-2040B and PEL-2041B.

PEL-2004A Mainframe
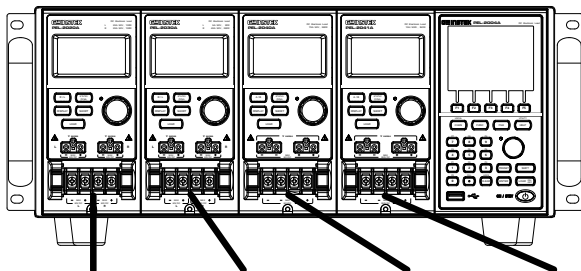
PEL-2020A(B) PEL-2030A(B) PEL-2040A(B) PEL-2041A(B)

PEL-2002A Mainframe
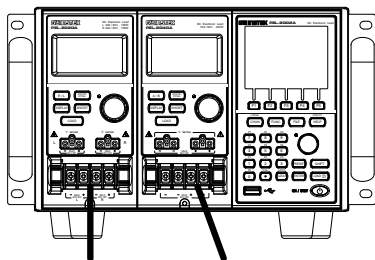
PEL-2020A(B) PEL-2040A(B)

The 8 different load module models each differ in the amount of current, voltage and power and the number of channels that the load module can accommodate. The procedures in this manual will be load module model independent unless specifically stated.

Below is a table showing the basic differences between each load module model. For detailed specifications, please see page 310.

Load Module	Channels	Power (W) CH L/R (low/high range)	Current (A) Range Low/High	Voltage (V)
PEL-2020A(B) (100Wx2)	2	100/100	2/20	0-80
PEL-2030A(B) (30/(25/250W))	2	30/(25/250)	5/4/40	0-80
PEL-2040A(B)	1	(35/350)	7/70	0-80
PEL-2041A(B)	1	(35/350)	1/10	0-500

Package Contents and Accessories

The PEL-2000A electronic load has a number of standard and optional accessories that can be ordered. For more information please visit the GW Instek website at www.gwinstek.com or consult your authorized distributor for details.

Standard Accessories	Description
Power Cable	Mains power cable (region dependent) (18AWGx3C, 125V/10A, 1.8m)
CD ROM	Contains PEL-2000A series Electronic DC Load User Manual, Programming Manual and USB Driver
GTL-120	Load cables 2X red, 2X black (per load module)
GTL-121	Remote sense cables, 1X red, 1X black (per load channel)
PEL-003	3 sets for PEL-2004A; 1 set for PEL-2002A

Options	Description
PEL-2020A(B)	Load Module
PEL-2030A(B)	
PEL-2040A(B)	
PEL-2041A(B)	
PEL-001	GPIB interface
PEL-016	LAN interface

| Optional Accessories	Description
GTL-232	RS-232C
GTL-246	USB
GTL-248	GPIB cable
GTL-249	Frame link cable

Measurement Overview

The PEL-2000A series has a number of different operating modes that are completely configurable. All the modes have customizable Go/NoGo limits, range limits, timers, slew rates, alarms and protection limits. For parallel loads, there is a dedicated Parallel configuration mode. To make tests, Programs and Sequences can be created.

Function	Description
Constant Current Mode (CC)	In constant current mode, the load module will sink a constant amount of current, regardless of the voltage.
Constant Voltage Mode (CV)	Under constant voltage mode, the voltage remains unchanged, regardless of the current.
Constant Resistance Mode (CR)	In constant resistance mode, the resistance load will remain unchanged as the voltage and current remain proportional.
Constant Power Mode (CP)	In constant power mode, the load module will ensure the power consumed is constant.
Programmable Sequences (Prog.)	The load module supports programming sequences. With up to 120 different memory settings in 12 programs with 10 sequences.
Sequences (Seq.)	Used to create load profiles to accurately simulate a load. Sequences can be created for each channel.
Group Unit Mode	Group Unit Mode enables the PEL-2000A series mainframes to easily use load modules (of the same type/rating) in parallel. Parallel mode is used in conjunction with CC or CR modes. CP and CV mode cannot be used with this mode.

Front Panel Overview
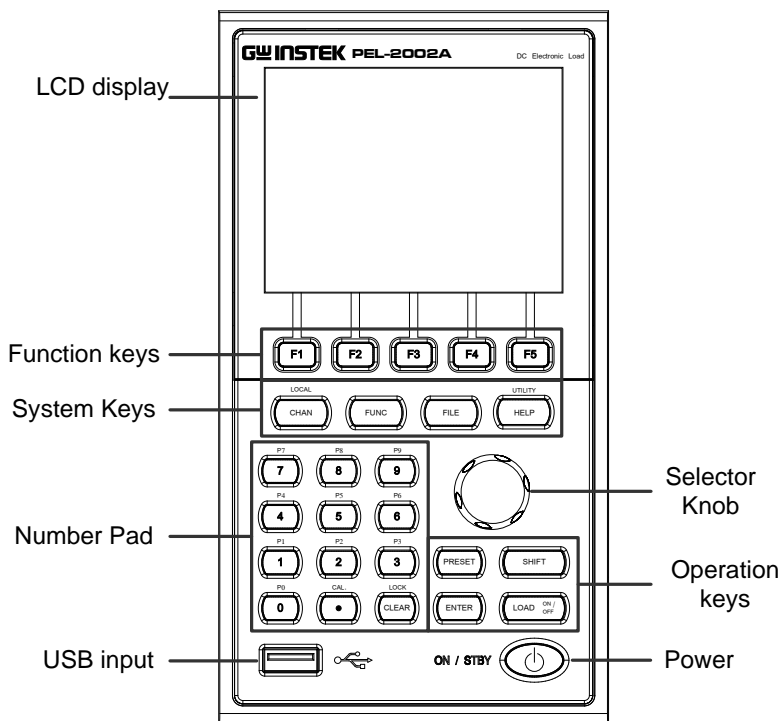
LCD display	320 by 240, TFT LCD display.

Function keys	$\boxed{F1}$ ~ $\boxed{F5}$	Assigned to the menu functions on the bottom of the display.

System Keys	**LOCAL** $\boxed{CHAN}$	CHAN/LOCAL is used to select the load channel. Combined with the shift key, Local is used to activate local control (during remote control via the interface or frame link connections).

LOCAL **CHAN**	Brings up the Channel Menu.
SHIFT + CHAN (LOCAL)	Used to activate local control mode during remote control via the interface
FUNC	Used to access the Program, Sequence or OCP automation menu.
FILE	Used to access the File menu.
UTILITY **HELP**	Brings up the Help menu and utility menu.
UTILITY **HELP**	Provides help for the last function /key pressed.
SHIFT + HELP (UTILITY)	Activates the Utility Menu.
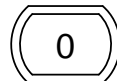
Number pad	Enter numerical values, or to save/recall presets (P0-P9).
P0 **0**	Number values.
PRESET + 0 (P0)	Preset numbers P0-P9.
CAL. **•**	Decimal point and Calibration key

CAL.	Decimal point.
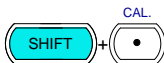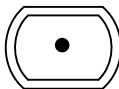
SHIFT + CAL.	Activate calibration mode.

⚠ Note　　Please note, calibration mode is not supported. Please see your distributor for calibration needs.

LOCK CLEAR	Clears current values. Alternative function locks the keys and the Selector knob.

LOCK CLEAR	Clears the current value.
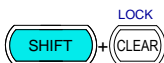
SHIFT + LOCK CLEAR	Locks all the keys and Selector knob.

USB Input	⟿ USB flash memory slot.
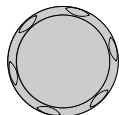
Selector Knob	Used to select operations and to increase/decrease values.
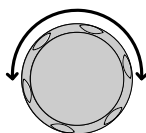
	When turned left or right moves the cursor in menus or changes the selected item or value.
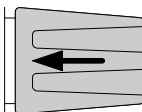
	When pushed down, acts as the Enter key.

Operation Keys

PRESET — Saves and recalls preset settings and values.

When pressed in combination with the number pad, Presets P0-P9 can be recalled or saved.

PRESET	Inactive
PRESET	Active. Used in combination with the number pad and/or shift key.
PRESET + 0 (P0)	Press to recall a channel preset Hold to save a channel preset
SHIFT + PRESET	Press to recall all channel presets. Hold to save all channel presets.
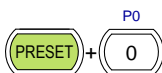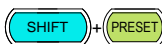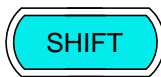
SHIFT — The shift key is used to access alternate functions assigned to select keys.
The shift key is also used to toggle between coarse and fine control mode when used in conjunction with the selector knob to adjust parameters.

SHIFT	Inactive mode.

SHIFT	Active. When active the shift key can be used to access the Local and Utility menus.
SHIFT + ⟳	Coarse control mode.
SHIFT + ⟳	Fine control mode
ENTER	Confirms selections.
LOAD ON/OFF	Turns the current load/channel on or off
LOAD ON/OFF	Load is currently off. (unlit)
LOAD ON/OFF	Load is currently on. (orange light)
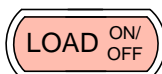
Power	ON / STBY ⏻	Turns the unit on or into standby mode.
	ON / STBY ⏻	Standby mode.
	ON / STBY ⏻	On.

Display Overview – Mainframe

| 05/04/23 | FRM | | USB |
| 16 : 50 | | SEQ | Alarm |

Mainframe Status Panel

A Value	80.00 V
B Value	80.00 V
Curr Limit	40.00 A

*CH1
CVH

SPEC
Slow1
EXT
80V
main

Main Screen

Current Operation Channel Status Panel

| Mode | Range | Response | IMeas | Configure |
| CV | High | Slow1 | High | |

Menu Icons

F1   F2   F3   F4   F5
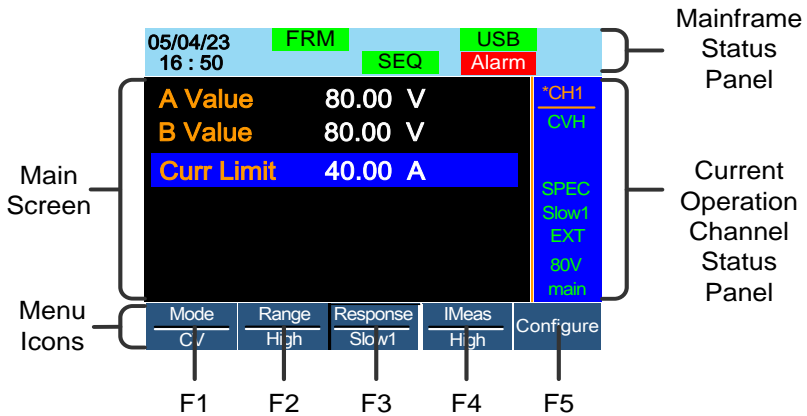
| Mainframe Status Panel | The Mainframe Status Panel displays the status of the Mainframe interface, programs and alarm status. |

| 05/04/23 | FRM | | USB |
| 16 : 50 | | SEQ | Alarm |

Framelink status

Load type

Alarm

Interface status
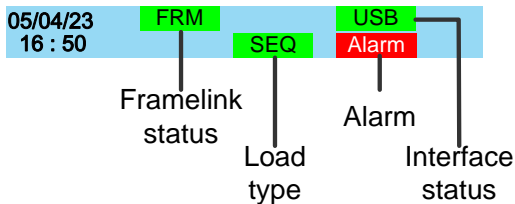
| Frame Link Status | FRM ⇕ FRS | Indicates Frame Link is turned on and that the mainframe is set as either a master (FRM) or slave (FRS) unit. |

Load Type	LOAD LOAD ↕ PROG PROG ↕ SEQ SEQ	The Load Type Icon indicates if a Sequence (SEQ) or Program (PROG) is turned on. If not then LOAD is displayed as default. When any Load type is running, their icon will turn orange.
Interface Status	RS232 ↕ GPIB ↕ USB ↕ LAN	The interface status icon displays which interface type is set.

Current Operation Channel Status Panel   The Current Operation Channel Status panel generally displays the status of the current channel.

Channel —— *CH1
              CVH   —— Mode

Go/NoGo —— SPEC
Channel Control —— Slow1
              EXT   —— Response Speed
              80V   —— Voltage Range
Menu —— main
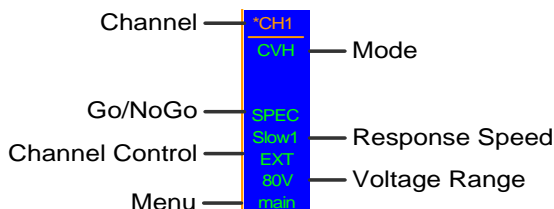
Channel	CH1~ CH8	Displays the current channel.
	*CHx	* = independent mode
	CHxS	S = Group channels Sync mode
	CHxP	P = Group channels Parallel mode

Mode		Displays the current mode.
	CCL	CC Static Low Range
	CCH	CC Static High Range
	CCDL	CC Dynamic Low Range
	CCDH	CC Dynamic High Range
	CRL	CR Static Low Range
	CRH	CR Static High Range
	CRDL	CR Dynamic Low Range
	CRDH	CR Dynamic High Range
	CVL	CV Static Low Range
	CVH	CV Static High Range
	CPL	CP Low Range
	CPH	CP High Range
Go/NoGo	SPEC	If Go/NoGo is turned on, SPEC will be displayed.
Response Speed	Slow1/ Slow2/ Slow3 Fast	In CV mode the response speed will be shown, Slow1/ Slow2/ Slow3 or Fast.
Channel Control	EXT	When Channel Control is set to External, EXT will be displayed.
Voltage Range		Displays the voltage range of the current setting.
Menu		Shows the current menu.

	main	= Chan menu
	conf	= Chan→Configure menu
	s_edit	= Chan→Seq.Edit menu
	file s_loop	= File menu
		= Chan→Seq.Edit→Loop menu

Main Screen	Main display screen.	
Menu Icons	F1~F5	Each Menu Icon is controlled by the F1~F5 function keys directly below.

Rear Panel Overview

PEL-2002A

Go/NoGo
 Output

RS232C

GPIB

USB-B
terminal

USB-A
terminal

Frame Control 1,2

Power switch,
Power Socket, Fuse

Channel
Control, 1~4

PEL-2004A

Go/NoGo
 Output

RS232C

GPIB

USB-B
terminal

USB-A
terminal

Frame Control 1,2

Power switch,
Power Socket, Fuse
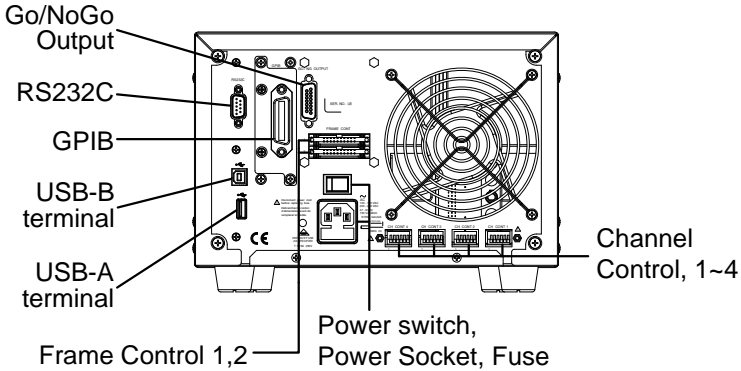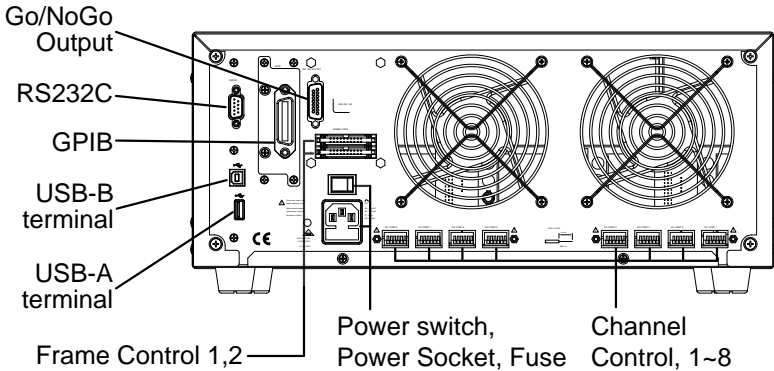
Channel
Control, 1~8

| Go/NoGo Output | GO / NG OUTPUT | The Go/NoGo Output terminal outputs a pass (high)/fail (low) voltage for each channel. |
| | | See page 264, 59 for details. |

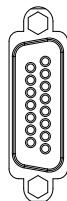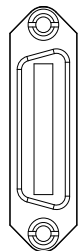|		
GPIB port		The GPIB port is used for remote control connections.
		GPIB: 24-pin female
		The GPIB card can be pulled out and replaced with a LAN card. After the LAN card being inserted, it has the Ethernet network function.
LAN port	LAN	Ethernet port for controlling the PEL-2000Aremotely.
		See pages 237 for remote control details.
USB-B (Device) port	DEVICE	The USB-B (device) port, like the RS232C/GPIB/LAN port is used for remote control.
Frame Control Port	**FRAME CONT** 1 2	The Frame Control port is used for Frame Link connections. Mainframes are daisy-chained together. There are two Frame control ports.
		1: Slave
		2: Master
		Connection type: MIL 20-pin connector.
		For details about frame link connections see page 54, 261.
Power Switch	−0	External Power Switch
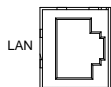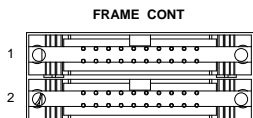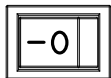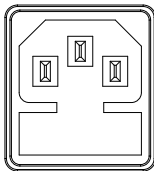
Power Socket/ Fuse		The power supply socket accepts the AC mains Voltage. The fuse holder is located below the power socket. Power: 47~63Hz Fuse: T3.15A/250V For fuse replacement details see page 295.
Channel Control port (1~8)	CH CONT 1	Each channel has a dedicated Channel control port to enable external monitoring and control. The channel control port has 6 wire sockets that are screw-less and self clamping. Required wire gauge: 24 AWG For connection or specification details see pages 56 & 259.
RS232 port	RS232C	Connect the RS-232C cable (Part no. GTL-232) to the rear panel port: DB-9 male connector.
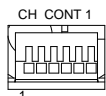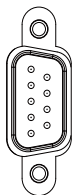
Front Panel Overview – Load Module
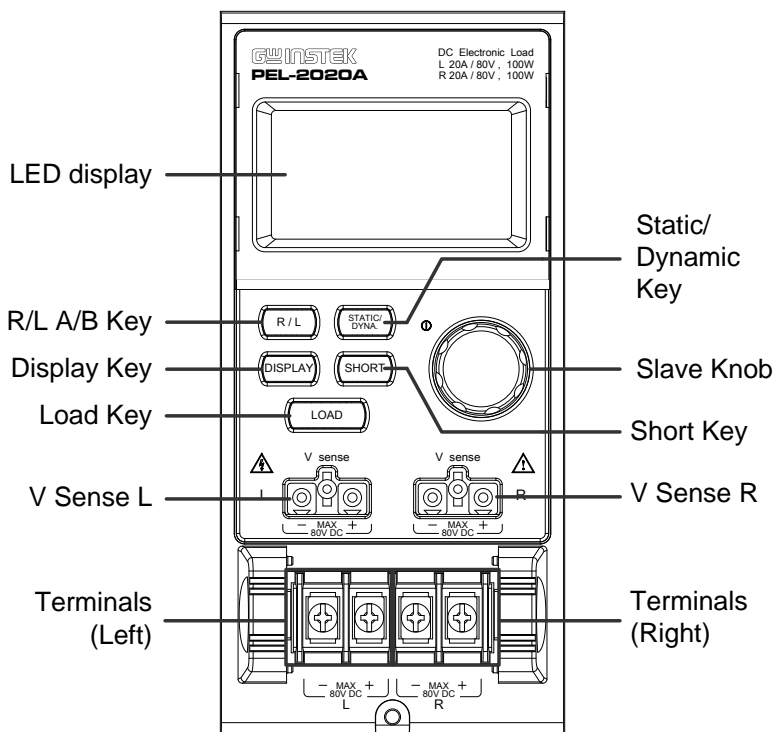
LED display	2x5 digit custom LED display.

Right/Left Key or A/B Key	R/L A/B	The L/R key is used to switch between the right and left load channel on a dual channel load module. The A/B key is used to switch between A&B Values for single channel load modules.
Display Key	DISPLAY	Used to alternate the display output on the load module.
	0.0.0.0.0. A	Current
	0.0.0.0 ᵛ	Voltage

	`0.0.0` w	Power
	`0.0` s	Load time

Load Key	LOAD	Activates the load for the active channel. (Right or Left)(A or B)
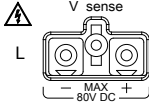
Left Voltage Sense	V sense ⚠ L MAX 80V DC	The voltage sense terminals are used when precise measurement is needed. V Sense terminals are used to compensate for voltage drops across the main terminals caused by the resistance of the load wires.
Right Voltage Sense	V sense R ⚠ MAX 80V DC	
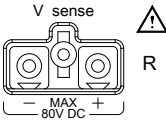
It is automatically activated when connected to a DUT.

The voltage difference between the DUT and load voltage should not exceed 2V, otherwise you will get incorrect measurement for the voltage. (applicable to all models)

Positive and Negative Terminals Left	MAX 80V DC L	The terminals for both the left and right side of a load can draw differing amounts depending on the load module specifications.
Positive and Negative Terminals Right	MAX 80V DC R	For 2 channel load modules, the left terminals are used for the 1st channel and the right terminals are used for the 2nd channel.
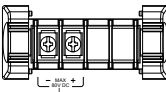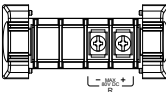
On single channel load modules, the left terminals are the lower (-) potential terminals, whilst the right terminals are the positive (+) potential terminals.

Static/Dynamic Selector Key	**STATIC/ DYNA.**	The STATIC/DYNA. Key manually switches the load from Static (manual) to Dynamic loads.
		Dynamic loads are only supported in CC and CR mode. For more information see page 61 & 64.
Slave Knob (Load)		The Slave Knob is used to edit and vary parameters for the active channel on the local load. Depending on the Mainframe setup, the Slave Knob will either only update the load (locally) or will update both the local module and the mainframe*. The Slave Knob can also be configured to display measured or set values on the local load module**.
		* For more information on "Knob Type", see page 206. ** For more information on "Slave Knob", see page 209.
Short Key	**SHORT**	The SHORT key is used to manually short circuit the active channel on the local active load.
		The Short key can be set to enable or disable in the configure setting.
		Please refer to page 181 for details.
		Load on: Pressing or holding the SHORT key will short the load, depending on the short type selected.
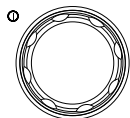
LED Display Overview – Load Module
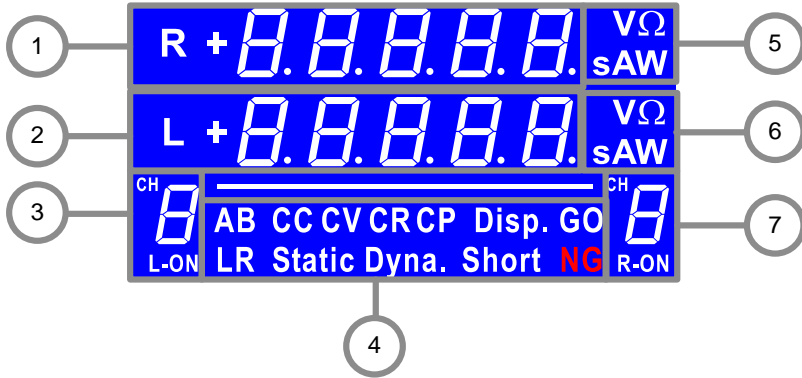
① & ②
Channel Display

$R_{or}L$ Left and right channel indicator.

5 digit display.

③ & ⑦
Channel Number Indicator

	CH ⊟	Indicates the channel number (1-8).
	L-ON	Indicates if the load is active on the load module. (Dual channel load modules)
	ON	Indicates if the load is on for single channel load modules.

④
Mode Indicator

The Mode Indicator LEDs will indicate what the current mode or settings are on the active channel(s).

**AB CC CV CR CP Disp. GO
LR Static Dyna. Short NG**

A or **B**   Value A or B for a single channel load module. Applies to CR, CV, CP and CC static mode only.

CC   Constant Current Mode (CC) mode activated.

CV   Constant Voltage Mode (CV) mode activated.

CR   Constant Resistance Mode (CR).

CP   Constant Power Mode (CP).

Disp.   Display is shown on dual channel load modules when both left (L) and right (R) channel information is displayed.

Press the Display button repeatedly to show information for both channels.

GO   Lights up when Go/NoGo is activated and the load passes (GO) the Go/NoGo limits.

L or **R**   L or R will light up when the left or right channel is selected.

Static   Lights up when in Static mode.

Dyna.   Lights up when in Dynamic mode.

Short   Lights up when a load is shorted.

	NG	Lights up when Go/NoGo is activated and the load fails (NG) the Go/NoGo limits.
⑤ & ⑥ Channel Unit Indicators	**VΩ sAW**	The Unit Indicators display the current unit.

	V	Voltage
	Ω	Resistance
	A	Current
	W	Power
	s	Second

Installation

The installation chapter describes how to load the different load modules, install the optional GPIB card, the rack mount kit and how to determine each channel number.
If you need to move all installed device to another location, please disassembly the modules first, and then reassembly the modules after moving to the desired location.

Load Module Installation

⚠WARNING | To avoid static electricity, please use appropriate anti-static work practices.

⚠Note | If your Master is PEL-2004A/ PEL-2002A, the mainframe firmware version must be V3.01.UPG or above.

The firmware file and upgrade procedure can be downloaded on the GWInstek website.

Module installation | The PEL-2004A and PEL-2002A can accommodate 4 and 2 load modules, respectively. Module loads can have 1 or 2 channels. Installation of load modules is the same for both models.

Steps | 1. Ensure the mainframe is turned off from the rear panel. Disconnect the power cord.
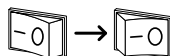
2. Slide the module onto the rails of an empty load slot.
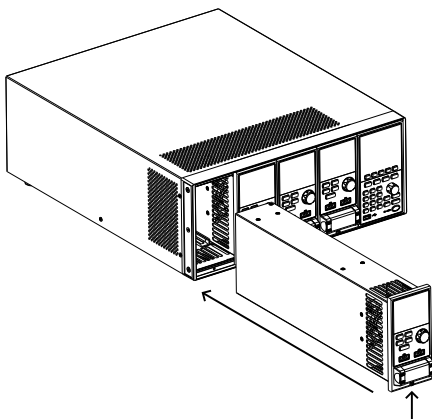
3. Use the supplied screw to fix the module to the load slot, located under the load terminals.
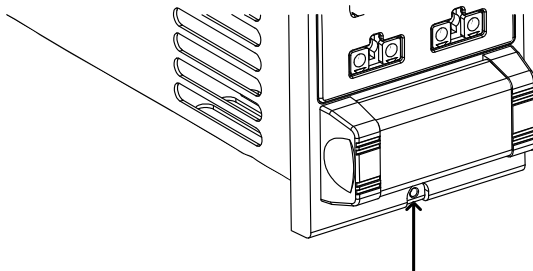
4. Install any additional modules as described above.

5. If there are any slots empty, install the supplied panel cover (part number: PEL-003). The panel cover will improve safety and increase air flow.
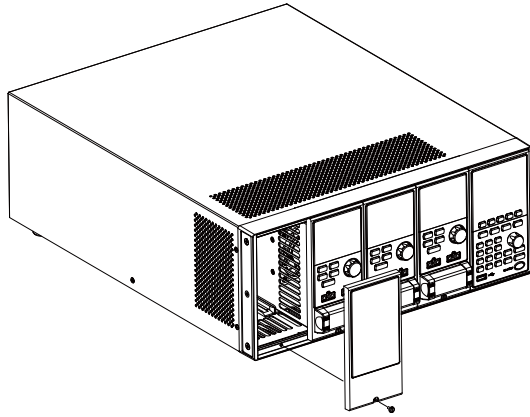
6. Use the supplied screws to fix the panel cover(s) over the load slot.
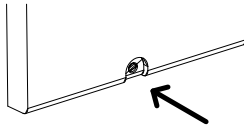
GPIB Installation

⚠ WARNING	To avoid static electricity, please use appropriate anti-static work practices.
GPIB Card installation	The PEL-2004A/PEL-2002A has GPIB as an option (part no. PEL-001).
Steps	1. Ensure the mainframe is disconnected from mains power.
	2. Remove the screws from the GPIB cover plate and remove the cover plate from the rear panel.
	3. Slide the GPIB card into the slot and push gently until the back plate is flush with the rear panel.
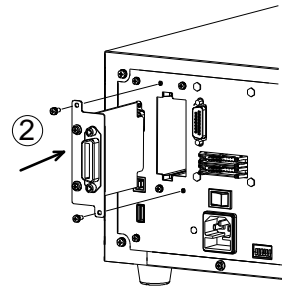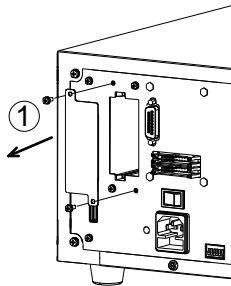
4. Use the screws that were removed from step 1 to secure the GPIB card.

⚠ Note	The GPIB card can be replaced with a LAN card, which has Ethernet network function.

Rack Mount Installation

Background   The PEL-2004A can be used in a standard 19″ rack mount enclosure with the optional rack mount kit (part no. 11EL-20040201). Each unit requires a rack height of 4U with a 1U space for ventilation top and bottom. The rear of the rack mount enclosure must be free of obstruction to allow heat to dissipate from the mainframe(s).

Steps   1. Screw the rack mount brackets as shown below using the supplied bolts.

PEL-2004A
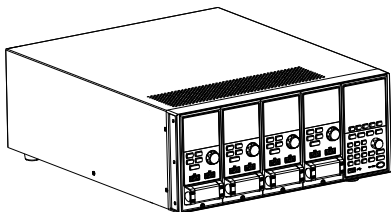
2. Insert into a standard 19″ rack enclosure with at least 1U of space top and bottom for ventilation.

1U

1U
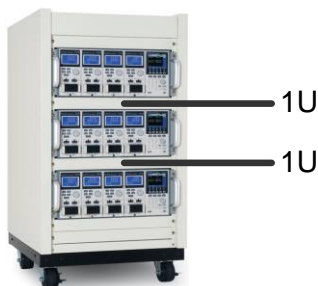
Channel Number

Description   The channel number for a module load is determined by which slot it occupies on the mainframe chassis. There can be 1 or 2 channels per slot, depending on the load module type.

The PEL-2002A has two slots; The PEL-2004A has 4 slots. Channel 1 is the farthest away from the main display panel and channel 8 (PEL-2004A) or channel 4 (PEL-2002A) is the closest to the main display panel.

Below the PEL-2004A has all 4 slots occupied with the PEL-2020A(B), PEL-2030A(B), PEL-2040A(B) and PEL-2041A(B) load modules (LM), respectively. The PEL-2020A(B) & PEL-2030A(B) have 2 channels per load module, the PEL-2040A(B) & PEL-2041A(B) have only 1. So the channel determination is:

LM1: CH1, CH2; LM2: CH3, CH4; LM3: CH5; LM4: CH6.
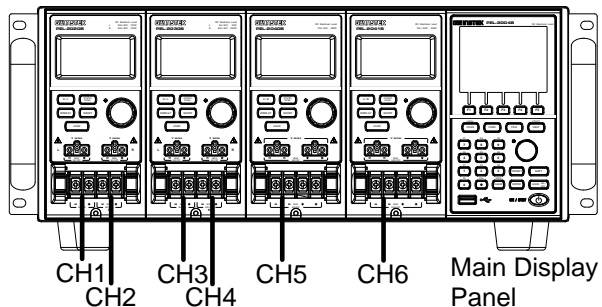
Power Up & Self Test

Panel operation   3. Connect the power cord to the power socket.
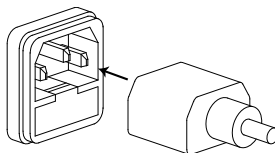
4. Turn the external power switch on.
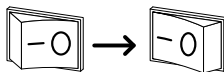
5. Hold the power button on the front panel to turn on the power.

ON / STBY

The power button turns green from red (standby).
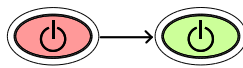
⚠️WARNING   Ensure that the power outlet has a ground socket. The power outlet will have a ground connection if it is a 3 socket type.

Upon turning on, the Mainframe will perform a self-test. The self-test checks the System, followed by any attached channels.

⚠️ Note   When the firmware version of the mainframe and the slave are not identical, a message "The firmware will be updated, please access to website www.gwinstek.com to confirm the firmware version." will appear on the mainframe.

Initial	System	Success
	CH1	Success
	CH2	Success
	CH3	Success
	CH4	Success
	CH5	Success

When the system check happens, the load modules will display each channel as it is checked, then display the current mode.

```
PEL-
2040A
```
→
```
0.000 V
0.0000 A
CC
Static
```

```
PEL-
2040b
```
→
```
0.000 V
0.0000 A
CC
Static
```
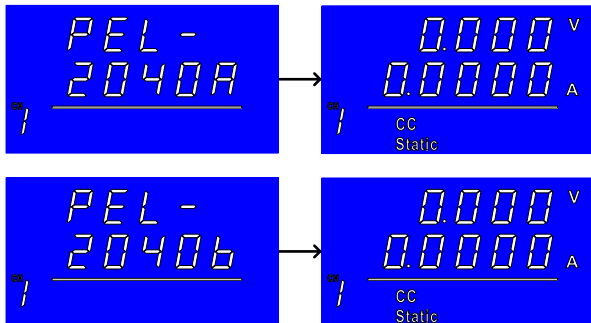
6. If any of the System checks fail, please power down the load and reinstall the appropriate load module(s).

7. To turn off the load, hold the power button for a few seconds.

ON / STBY

The PEL-2000A mainframe will return to standby mode.

Load Connections

Precautions and Procedures

Introduction   The PEL-2000A series supports a number of
                different load configurations for flexible
                operation.

- Single DUT, single load

- Single DUT, parallel load

- Multiple DUTs, multiple loads

- Multiple DUTs, multiple mainframe loads

- Single DUT, parallel mainframes

The PEL-2000A series also supports a number of
different control methods and interfaces. The
connections used are described here:

- Frame link

- Channel control

- Go/NoGo

Wire Gauge   Before connecting the PEL-2000A series, wire
considerations   gauge must be taken into account. Load wires
                 must be large enough to resist overheating when a
                 short-circuit condition occurs as well as maintain
                 a good regulation. The size, polarity and length of
                 a wire are all factors in determining if a wire will
                 withstand short circuiting.

Wire Selection	Wires that are selected must be large enough to withstand a short circuit and limit voltage drops to no more than 2V per wire. Use the table below to help make a suitable selection.

AWG	Max Current A(Amp)
24	7.64
22	10.0
20	13.1
18	17.2
16	22.6
14	30.4
12	40.6
10	55.3

Load Line Inductance Considerations	When using the PEL-2000A series, voltage drop and voltage generated due to load line inductance and current change must be taken into account. Extreme changes in voltage may exceed the minimum or maximum voltage limits. Exceeding the maximum voltage limit may damage the PEL-2000A series.

To determine the voltage generated, the following equation can be used.

$$E = L \times (\Delta I / \Delta T)$$

> E= voltage generated
>
> L=load line inductance
>
> ΔI= change of current (A)
>
> ΔT= time (us)

Load line inductance (L) can be approximated as 1uH per 1 meter of wire. ($\Delta I / \Delta T$) is the slew rate in A/us.
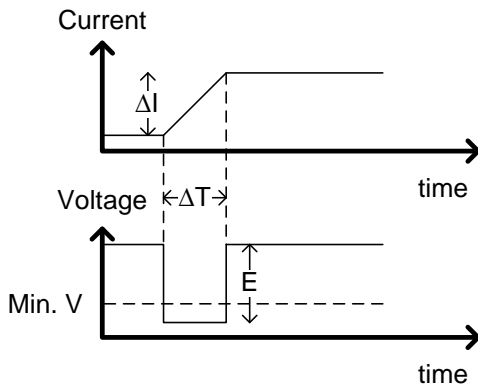
Current

The diagram above shows how changes in current can affect voltage.

Limiting Load line inductance	Load line inductance can be reduced by ensuring load wires are as short as possible and by twisting positive and negative load wires together. Current change can be limited by limiting the slew rate when switching.

"Twisted pair" will be shown on any connection diagram where the load wires should be twisted together.
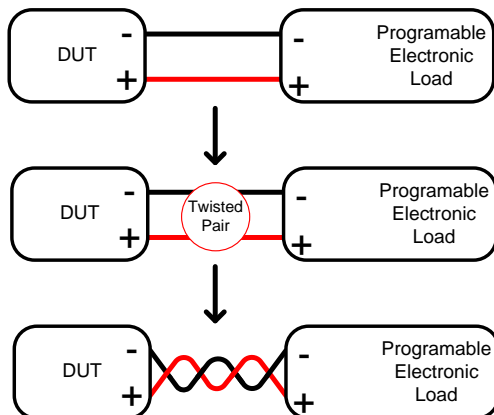
Load module considerations	The PEL-2000A series supports single and dual channel load modules.

Single channel load modules have one bank of negative terminals and one bank of positive terminals. Each terminal pair has a 40A capacity. For higher loads, each terminal can be wired in parallel to increase capacity.

Dual channel load modules have one bank of positive and negative terminals for each channel.

Single Channel Load Module

Dual Channel Load Module
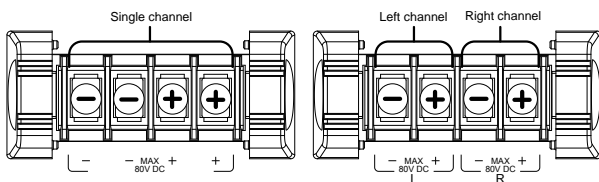
Connection	Follow the procedure below for all load connections.

⚠ CAUTION	Ensure that power is off from the load and the DUT before making any connections.

Steps	1. Carefully lift the terminal covers.
	2. Connect the positive (+) terminal on the load module to the high potential output of the DUT.
	3. Connect the negative (-) load terminal to the low potential output of the DUT.
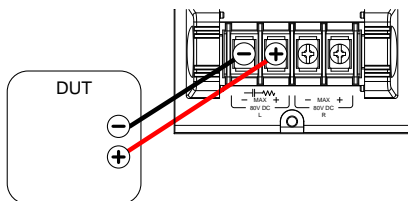
4. Close the terminal cover securely. Ensure the wires are secured properly and that the wires are not exposed when the cover is in place.

⚠ WARNING

Ensure that the wires are tied or twisted together to prevent noise and inductance.

⚠ CAUTION

Ensure the polarity is correct before proceeding with any connections. Using the wrong polarity could result in reverse voltage damage.
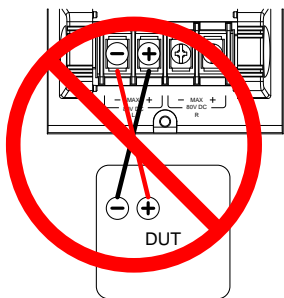
Ensure the input voltage doesn't exceed specifications. Exceeding the voltage specifications could result in damage to the instrument.

Terminal description and screw type

Remote (Sense) Connection

Background

The electronic load modules have two voltage sense contacts: Vsense +, Vsense -. Voltage sense can be used to help compensate for long cable length. The longer the cable, the higher the potential resistance and inductance, therefore a short cable is best. Twisting the cable can help reduce induced inductance and using the Vsense terminals compensates the voltage drop seen across the load leads, especially leads with higher resistance. This is useful when used in CV, CR or CP mode.

⚠ WARNING

Vsense + must have a higher potential than Vsense -.
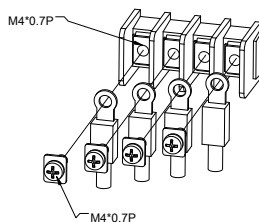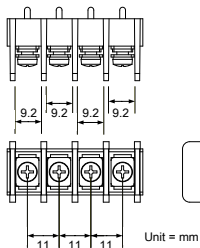
Connection

The diagram below shows how a DUT can be connected using voltage sense. Note that the sense wires are also twisted pairs.
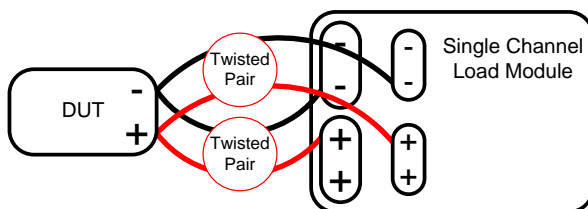
⚠ Note

The wire gauge for the sense wires should be no smaller than 16 gauge.

Input

The voltage sense terminals must use a wire gauge of 16 to 14 (Diameter 1.29mm ~ 1.63mm).

Remote Sense Terminal connection

The voltage sense terminals use a screw-less clamp connector. The clamp must be opened prior to inserting a wire. Use a small screwdriver to push the clamp release mechanism. Insert both wires then release the clamp mechanism.
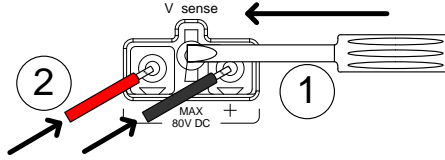
Single Load Connections

Dual Channel
Load Module
Connection

A dual channel load module can be used to sink two loads concurrently.
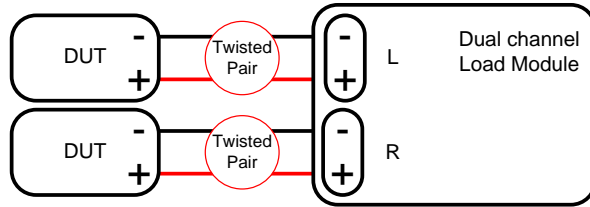
Single Channel
Load Module
Connection

On a single channel load module, the left terminals are both negative (-), whilst the right terminals are both positive (+). Note this also applies to the voltage sense terminals.
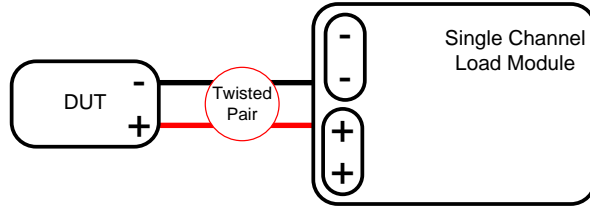
⚠ CAUTION

For loads exceeding 40A, both positive and both negative terminals must be used in parallel.
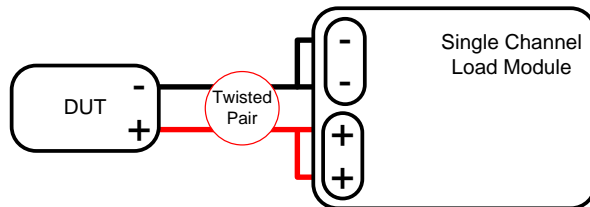
DC Connection   For purely DC operation, a resistor and capacitor can be connected in parallel to the electronic load to reduce oscillation. The capacitor and resistor values are dependent on the load settings. Ensure the capacitor ripple current is within allowable limits.
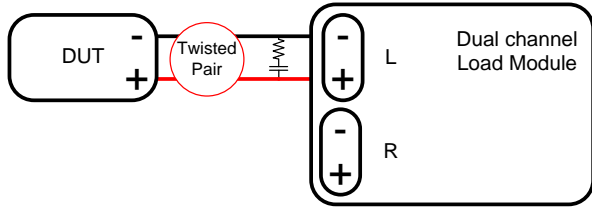
Low Voltage Connection   Using the load with low voltage loads is generally limited to over 1 volt (load module dependent). In order to support low voltage loads, an auxiliary power supply is needed to boost the voltage to a range suitable for the load.

Precautions:

• Take into account the combined power of the load and auxiliary power supply.

• Make sure the auxiliary power supply is able to provide enough current.

• Take into account any noise or irregularities from the auxiliary supply.

The diagram below shows a typical connection.
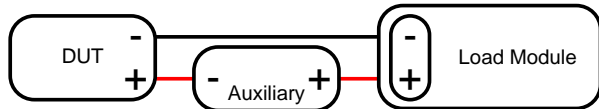
⚠ WARNING   Using an auxiliary power supply may induce reverse current. The PEL-2000A series has reverse voltage protection. For details see the protection section on page 82.

Parallel Load Connections

Parallel load modules

When the power output of a DUT exceeds the power rating of a channel or load module, the channel terminals, load modules or mainframes can be used in parallel to dissipate more power when used in CC or CR mode. Each channel will sink the amount of current specified. The total power sunk is the sum of all channels/modules. The amount of power can vary from each channel. For example if CH1 is 25A and CH2 is 20A, then the total current sunk is 45A. Parallel loads are supported for both static and dynamic loads (see page 80 for a description on parallel dynamic loading). Note that the same modules must be used when operating the parallel.

The PEL-2000A series also features a dedicated parallel configuration setting known as Group Unit. When Group Unit is turned on, load modules of the same type and rating to be used in parallel for CC and CR mode. See page 71 and 195 for more information.

Parallel load
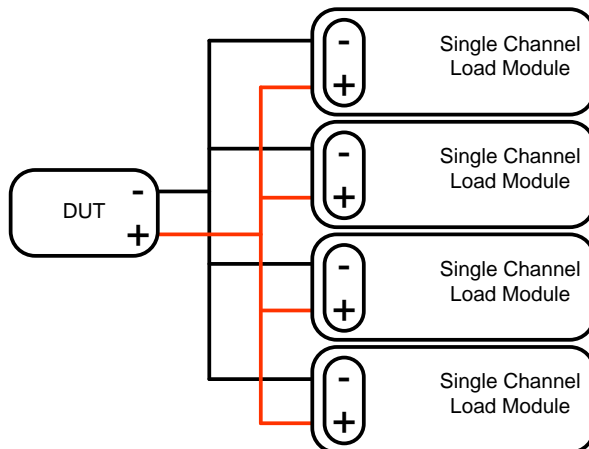
⚠ Note	Please note that the same load modules must be used in parallel.

Parallel loads using frame link connections | The PEL-2000A series mainframes can also be connected in parallel. Please note, when using a frame link connection there is a delay between the master and the slave. Please see page 54 for details.
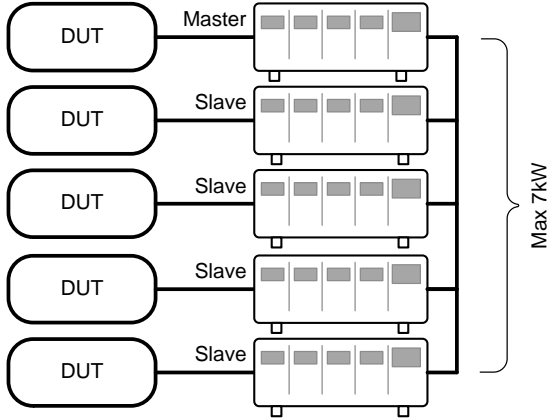
Multi-output power supply load | The PEL-2000A series is also able to sink a number of loads concurrently from multiple DUTs or sink a number of loads from the same DUT (i.e. multiple output power supply).
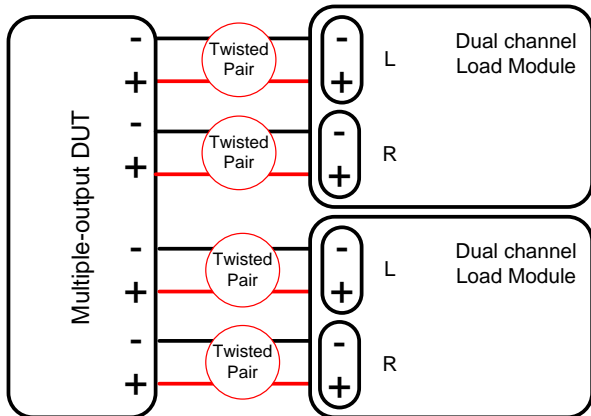
Frame Link Connection

Background   Frame link control involves connecting multiple
                    mainframes using the frame link connections. Up
                    to 4 slave mainframes can be connected to the
                    master mainframe. The first mainframe (master)
                    can be used to control the other slave frames.
                    There is a delay time of 2μs between the master
                    and first slave mainframe, and 4μs, 6μs, and 8μs to
                    the second, third, and fourth slave mainframes,
                    respectively. The connectors used are standard
                    MIL 20-pin connectors. For pin arrangement, see
                    page 261. The frame link cable (part no. GTL-249)
                    is an optional accessory, see page 16 for details.

Frame Link
Connection
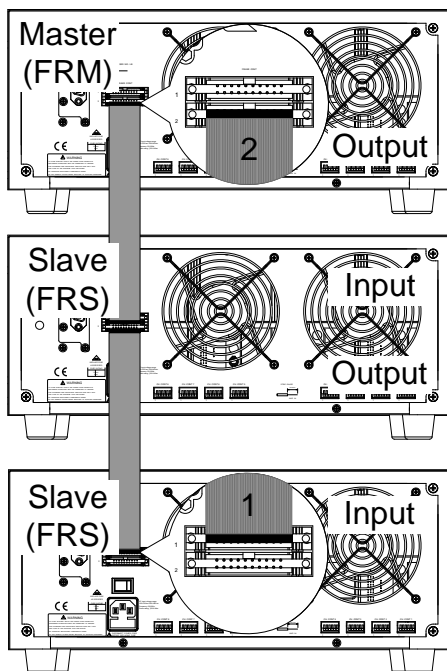
The first mainframe that is connected is the master frame; any additional frames are slave units. The ribbon cable connects to the master from connector 2, and the slave from connector 1. Each successive slave unit is connected in a cascading manner the same way.

Ensure the Mainframes are turned off before connecting the ribbon cables. Push the cable into the frame link connector. Ensure the arrows line up. The latches will close when the connection is complete. To remove, pull the latches out and connector will come out.

Insertion
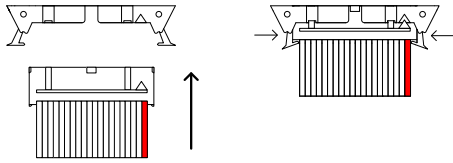
Removal
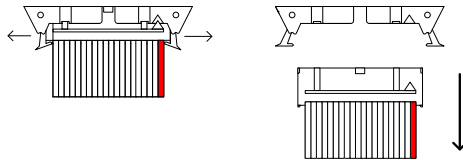
⚠️ WARNING   Ensure all the mainframes are off and disconnected from mains power before connecting.

Channel Control Connection

Background | The Channel Control connecters are located on the rear panel of each mainframe. There are two channel control connectors for each load slot, one for each channel, if applicable. The channel control connector is used to externally:

- Turn on/off loads.

- Supply a reference voltage.

- Monitor the load input.

For further details on channel control and the interface see pages 87, 259.
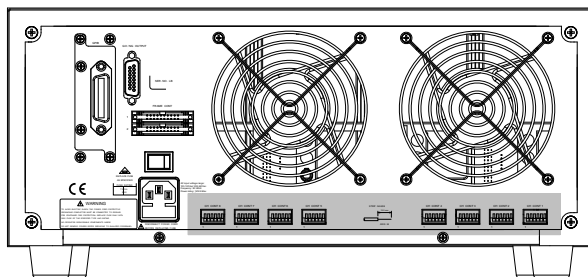
The Channel Control input/output pin layout is shown below.

6	+15V	Output
5	Load On	
4	EXT VREF	Input
3	V MON	
2	I MON	Output
1	GND	
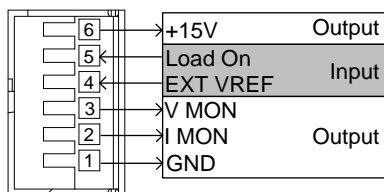
External Voltage Connection | The external voltage reference input must be between 0~10V.
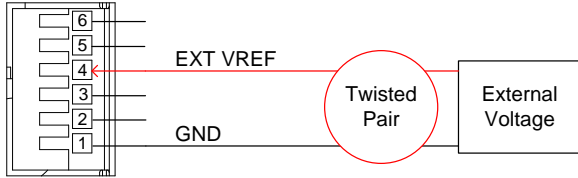
⚠ WARNING — Ensure the external voltage reference is stable and has low noise. The External Voltage should be no more than 10V.

The input impedance of the EXT VREF pin is 500kΩ.

No more than 12 volts may be used as an external voltage. More than 12 volts may damage the load.

Load on connection — To turn a load on, an active low voltage (0-1V) must be applied across Load On (pin 5) and GND (pin 1), similarly an active high voltage (2.4-5V) must be applied to turn a load off. The Load On input must be TTL.
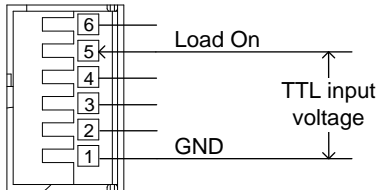
Voltage and Current Monitor Output — The Voltage Monitor Output (VMON) and Current Monitor Output (IMON) output the load input voltage and load input current as a percentage of rating current/voltage. Where 0 volts = 0% rating and 10 volts = 100% load input rating voltage or current.

The voltage monitor output is across pins 1 & 3, and the current monitor output is across pins 1 & 2. Pin 6 outputs a +15V reference voltage.

Below shows the pin configuration of the voltage and current monitor outputs.
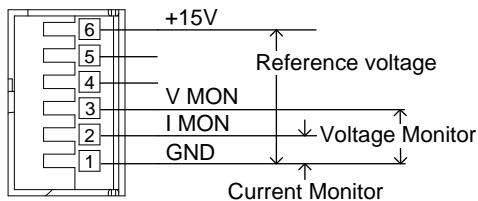
Connector
Connection

The channel control connector is a screw less clamp connector. The internal clamp mechanism must be opened before a wire can be inserted. To open the internal clamp, push the button above the wire socket, to close, release the button. Ensure at least 10mm is striped from the wire. The diagram below shows the wire insertion procedure.
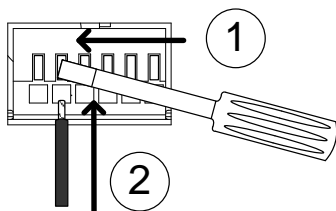
⚠WARNING

All connections to the channel control connector must use a 24 AWG wire gauge.

The output impedance of the V MON and I MON pins is 10kΩ.
The "+15V on pin6" used by customer application < 100mA Hold on 200mA.

Go/NoGo Connection

Background   The Go/NoGo port is a 15 socket port. Each
                 channel has a dedicated line for a Go/NoGo
                 output. The ports are open-collector with active
                 high (30V) indicating a pass and active low (1.1V)
                 as fail (an alarm). The Go/NoGo terminal is a DB-
                 15 female.

                 For more details on the Go/NoGo interface see
                 page 264.
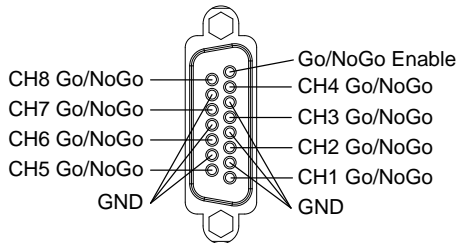
OPERATING DESCRIPTION

Operating Mode Description

There are four basic operating modes: constant current (CC), Constant Resistance (CR), Constant Voltage (CV/CV+CC) and Constant Power (CP). All channels operate using any of the modes. Each mode has a number of configurable options including slew rate, levels, protection modes, Go/NoGo and extensive save options.

Constant Current Mode

Background   In Constant Current Mode the load units will sink the amount of current programmed. Regardless of the voltage, the current will stay the same. There are two ranges in CC mode: High and Low. There are two main modes in CC mode: Static and Dynamic. Static mode can be used for stability tests and dynamic mode can be used to test transient load conditions.

Go/NoGo is supported for both High and Low range as well as Static and Dynamic mode.
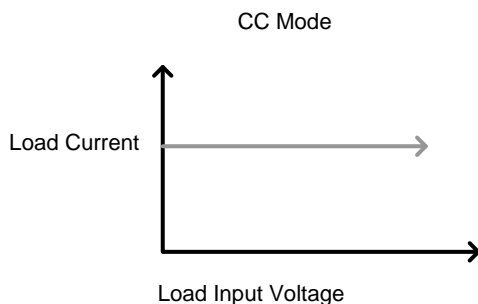
CC Mode

Range   There are two selectable ranges for constant current mode: high and low range.

Low range has a higher resolution, but a lower range. If the current exceeds the Low Range, High range must be used.

Static Functions Static mode tests the stability of the voltage output from a power source. Single channel load modules can have two 2 current levels A (A Value) & B (B Value). A & B have the same range. Pressing the A/B key on the module load will cycle through the A and B states. Alternatively, the mainframe can select A or B Value.

Dual channel load modules only have one current level (A Value) per channel in static mode.

Static Mode: Single Channel Load module.

CC Mode: Static

A Value — Slew Rate (rise)   Slew Rate (fall)

B Value —

Time 1   Time 2

Current
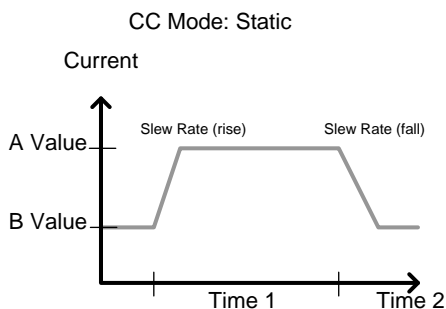
Dynamic Functions Dynamic load functions allow you to set load levels (Level1, Level2), load time (Timer1, Timer2), and the slew rate (rising, falling). Depending on the settings, the load will switch automatically between levels 1 and 2.

Dynamic loading can be used for charge discharge cycle testing etc.

CC Mode: Dynamic

Current

Level 1 —

Level 2 —

Timer 1 Timer 2 Timer 1   Time
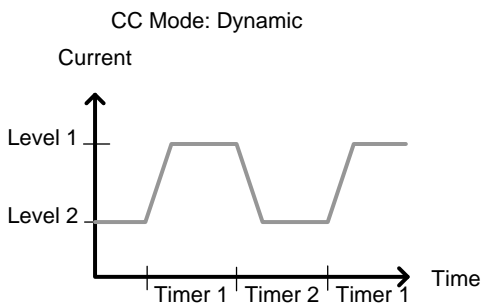
Slew rate   The slew rate is the rate at which the current will
                 increase to a set level. There are two slew rates:
                 rising slew rate & falling slew rate. In CC mode
                 the slew rate is defined as A/uS.
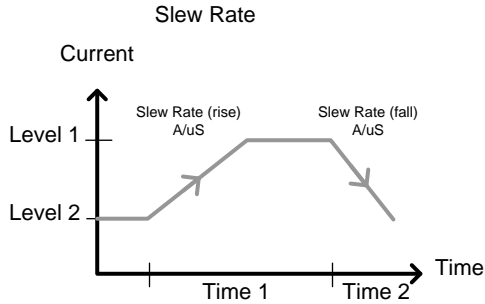
Slew Rate

As can be seen above, the rising and falling slew
rate need not be the same.

Go/NoGo   Using Go/NoGo, the Center, High and Low
                 voltage limits can be set for both Static and
                 Dynamic modes. A delay time of up to 1 second
                 can also be set.

CC Mode: Static:Go/NoGo

CC Mode: Dynamic:Go/NoGo
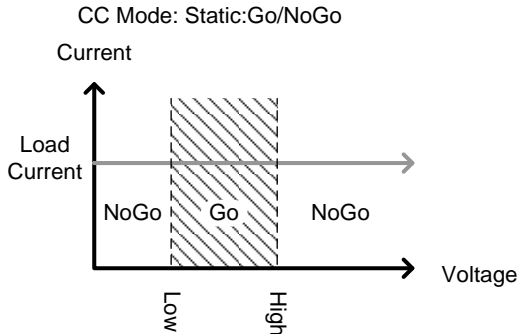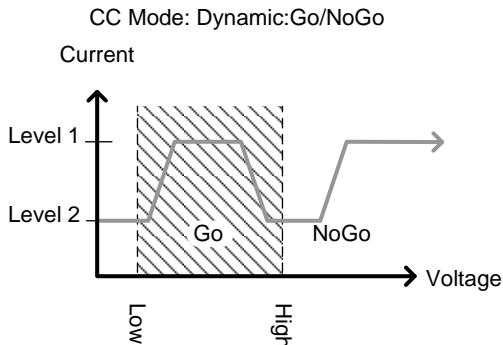
GO is specified as between the Low and High Go/NoGo limits. NoGo is specified as outside the Go/NoGo limits.

Constant Resistance Mode

Background   In Constant Resistance Mode the load units will linearly sink current and voltage to match a set resistance. CR mode has two different values (single load modules), two different ranges and rising and falling slew rates. Like CC mode, Constant resistance mode supports both dynamic and static loads. As with the other modes, Go/NoGo is supported.

CR Mode
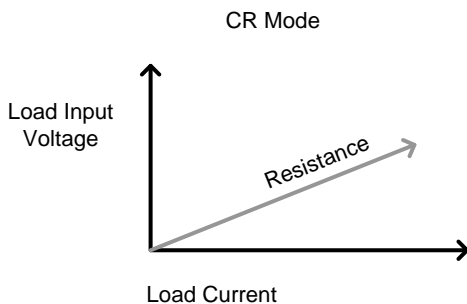
Resistance Range | There are two ranges: High and Low. The Low range is used for low voltage ranges, whilst the High range uses high voltage ranges. The current range always remains in High range, regardless of the selected resistance range.

Static Functions A/B range | For static mode, single channel load modules have two resistance levels. A & B have the same range. The A/B key can be used to switch between these resistance levels. Dual channel load modules only have one resistance level, A Value.

Single Load Module

CR Mode

Load Input Voltage

B Value
A Value

Load Current
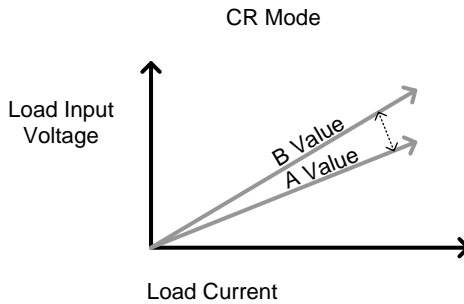
Dynamic Functions | CR mode supports Dynamic loading. Dynamic load has two resistance levels (Level 1&2), and two timers (Timer 1&2) to switch between the resistance levels. Rising and falling slew rates can be set to determine the speed at which the load switches between load levels.

CR Mode: Dynamic

Resistance

Level 1

Level 2

Timer 1 Timer 2 Timer 1

Time
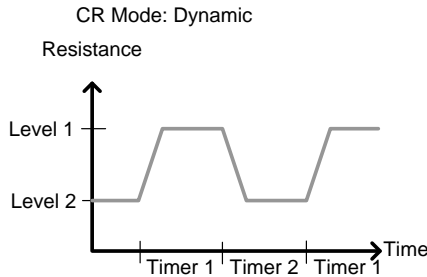
Slew Rate	The rising and falling slew rate (A/uS) determines the speed at which the load levels change from A to B Value (Static mode) or from Level1 to 2 (Dynamic mode) and vice versa.
Go/NoGo	Go/NoGo is also supported. Center, High and Low limits can be set as either percentages or voltage values. A delay time of up to 1 second can also be set.

CR Mode: GO/NOGO
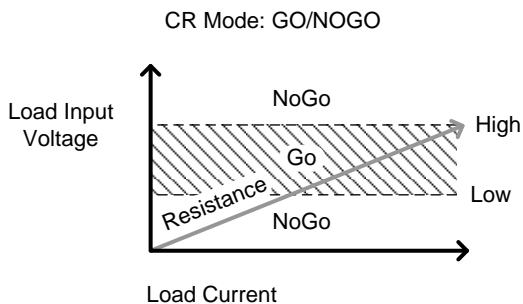
Constant Voltage Mode

Background	In Constant Voltage Mode the load units will sink current whilst keeping the voltage constant.
	Single channel load modules support 2 values (A Value, B Value) and have an adjustable cut-off current limit. Dual channel load modules only have A value.
	Response speed can also be set to fast (Fast) or slow (Slow). The response speed relates to the slew rate of the current response.
	Go/NoGo functionality is also supported either as a percentage or as a current value.

CV Mode

Load
Current

Load Input
Voltage
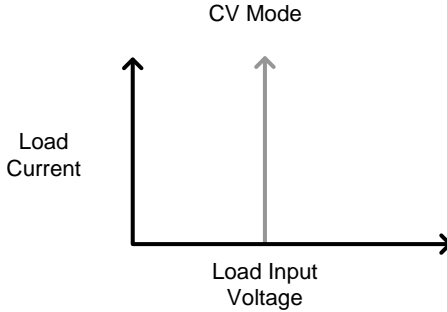
| Voltage levels | Two voltage levels can be set: A & B (single channel load module). |

CV Mode

Voltage

A value

B value

Time
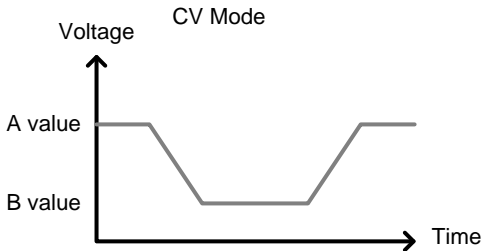
| CV + CC | When using CV mode, a current limit can be set for CV + CC mode. |

When the voltage input is greater than A Value (load voltage) then the channel will operate in CV mode if the input current is less than the current limit. When the input current exceeds the current limit, the channel will operate in CC mode.

When the voltage input is less than A Value (load voltage) current stops flowing.

CV + CC Mode

Current Limit

Input Current

Load Input
Voltage
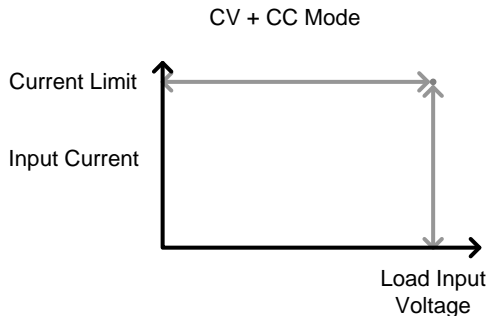
Response Speed	Response speed can be set to fast, slow1, slow2 or slow3. Fast response and slow1 (slow2/slow3) response are determined by the load module specifications. Slow response speeds are suitable for large loads as quick current changes will induce induction which can cause large voltage drops. The PEL-2000A series will try to rectify any voltage drops. However if voltage drops are too large, they may cause the load to go into oscillation. Large voltage drops caused by line voltage induction may damage the machine.
Go/NoGo	Go/NoGo testing can be with either current (Ampere) values (High, Low) or percentage values (Center, High %, Low %). A delay time of up to 1 second can also be set.

CV Mode: GO/NOGO

Load
Current

NoGo

High

Go

Low

NoGo

Voltage

Load
Voltage

Constant Power Mode

Background   In Constant Power Mode the load units will
              ensure a constant power load for the power
              supply.

              Single channel load modules support 2 values (A
              Value, B Value) and have an adjustable cut-off
              current limit. Dual channel load modules only
              have A value.

              Constant power mode can operate in high or low
              range.

              Go/NoGo functionality is also supported either as
              a percentage or as a current value.
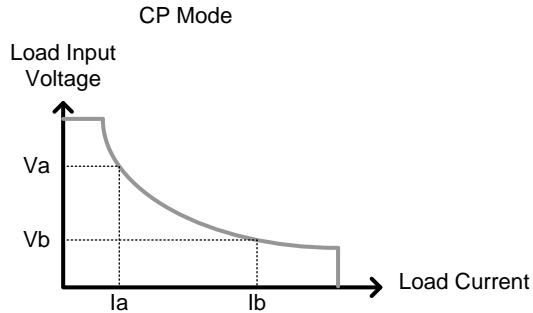
Power levels Two power levels can be set: A & B (single channel
              load module).
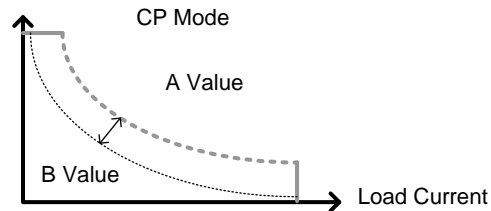
CP + CC   When using CP mode, a current limit can be set
                 for CP + CC mode.
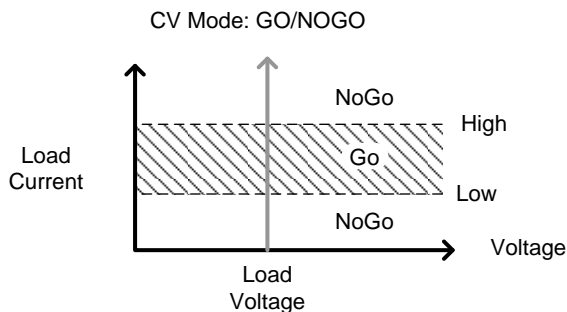   When the constant power current is less than
                 current limit, the channel will operate in CP mode.
                 When the constant power current exceeds the
                 current limit, the channel will operate in CC mode.

High/Low Range   There are two ranges: High and Low. The Low
                 range is used for low power ranges, whilst the
                 High range uses high power ranges.

V

CP Mode

High range

Low range

A
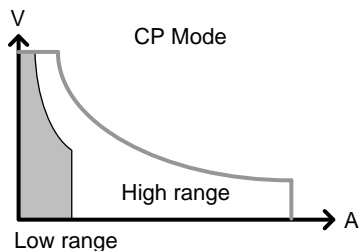
Go/NoGo   Go/NoGo testing can set High and Low Current
                 limits as a Value (in Amperes) or as a percentage.
                 A delay time of up to 1 second can also be set.

CP Mode

Load Input
Voltage

No
Go   Go   NoGo

Load Current
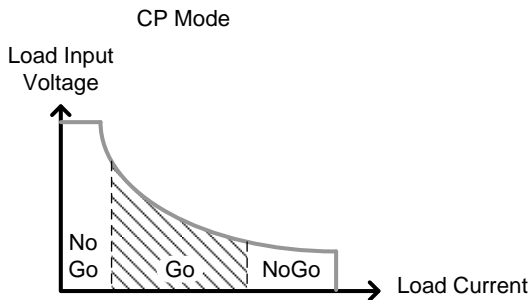
Group Unit Mode

Background	The Group Unit menu allows load modules of the same type and rating to be configured as a single unit when used in parallel. This saves the hassle of configuring each channel individually.
	Group Unit is only supported under CC and CR mode.
	Group Unit has three configuration settings: Total Unit, Group Mode and Display Mode.
Total Unit	This configuration setting sets the number units that are to be used in parallel and enables or disables the Total Unit mode.
Group Mode	The Group Mode setting determines how the Current Levels/Resistance Values are set when used in parallel. There are two settings: Para and Sync.
	The Para setting allows the all the parallelized load modules to be operated as a single large load module.
	Sync mode allows the settings of a single unit to be synchronized across all the other parallelized load modules.
CC Example	Consider 3 load modules set to CC mode in Parallel.
	In CC mode the total current for all units is the sum of each unit.
	$\text{Total } I = I_1 + I_2 + I_n$
	For example, to set a total load current of 90A, the Current Level setting in Para mode would be 90A, whilst it would be 30A in Sync mode.

Para mode   Sync Mode
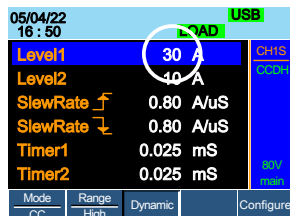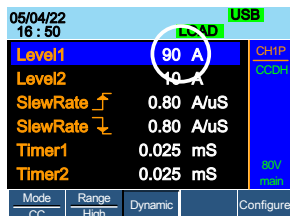
CR Example

When used in CR mode, the equation for equivalent resistance for all the parallel loads is:

$$\frac{1}{\mathrm{R}_{e\,q}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{Rn}$$

For example, if 2 load modules have a set resistance of 100Ω each, the equivalent resistance of the load modules would be 50Ω. The Level setting in Para mode would be 50Ω and 100Ω in Sync mode.

Para mode   Sync Mode
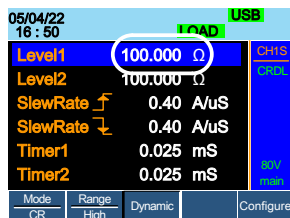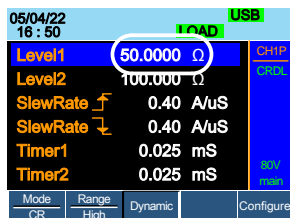
Display Mode

Display mode determines what units are displayed on the local load modules: V/I, V/W, I/W, S. The displayed units can only be controlled through this menu.

Run Program

Background	The Program function on the PEL-2000A series supports a total of 12 different programs at any one time with 10 sequences to each program. Up to 12 programs can be chained together. The Program function is able to create a number of Go/NoGo tests.
	Run Program is not supported in Group Mode (page 71).
Program Sequence	A program sequence is simply a single load test. A program is a battery of each of these tests run in succession. Each sequence loads the settings for each channel from Memory Data (Memory MXXX). The Memory Data stores settings such as the operating mode and range for each channel. Each sequence loads all channels at the same time, unless programmed otherwise. Sequences for each channel run synchronously.
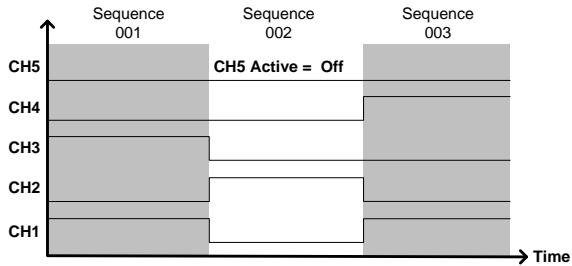
Each Sequence has a number of configuration options that apply to all the channels equally.

Sequence Item	Description
Memory	Loads the channel settings for each load module
	Range: M001~M120

Run	Sets the running configuration for the current sequence. The sequence can be skipped, run or run manually only.	
	Range: Auto | Skip | Manual	
On-Time	Sets the Sequence Run On-Time	
	Range: 0.1 ~ 60.0s	
Off-Time	Sets the Sequence Off-Time	
	Range: Off | 0.1 ~ 60.0s	
Short-time	Sets whether the Short-Time for the sequence.	
	Range: Off | 0.1s ~ On-time	
P/F-Time	Sets the Pass/Fail time for the sequence	
	Range: Off | 0.1 ~ (On-Time+Off-Time)-0.1s	
Short Channel	Selects which channel will be shorted during the sequence	
	Range: CH1 ~ CH8	

Program   Sequences are run sequentially to create a Program. There are 10 Sequences in each Program.
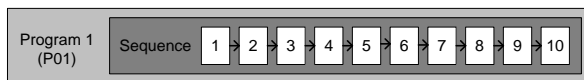
If less than 10 Sequences are desired for a Program, any additional Sequences can be skipped (not run).
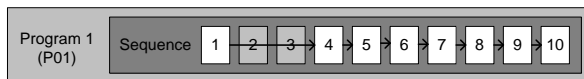
Sequence 2 & 3 are skipped.

Program Chain — Any of the 12 programs can be chained together to create a Program Chain. Unlike Program Sequences, Program Chains need not be run sequentially in numerical order. Any program can be chained to any program. It is possible to chain programs into an infinite loop to continue a program indefinitely.

Above, a program chain running sequences out-of-order.

Go/NoGo Results — If Go/NoGo limits have been configured, the Pass/Fail results for each channel will be displayed for all the sequences and programs.

Sequence

Background	The Sequence function is used to create high resolution load simulations. Each Sequence can be configured to create a unique load profile to accurately simulate loads in real time. Sequences are only applicable for CC (Static) and CR (Static) modes.
⚠️Note	Sequences are not to be confused with the sequences used to create a program. They are not the same and cannot be used interchangeably. Sequences (SEQ memory) cannot be used in Programs and Programs cannot load Sequences.
Load Profiling	The Sequence function is able to simulate a load to a high resolution. Each channel is able to change its load sink within 25us ~ 60000s per point independently. When used in parallel, multiple loads can be set concurrently to simulate the loads placed on multiple output power sources.
	The diagram below shows the load profile of a DUT at start-up.
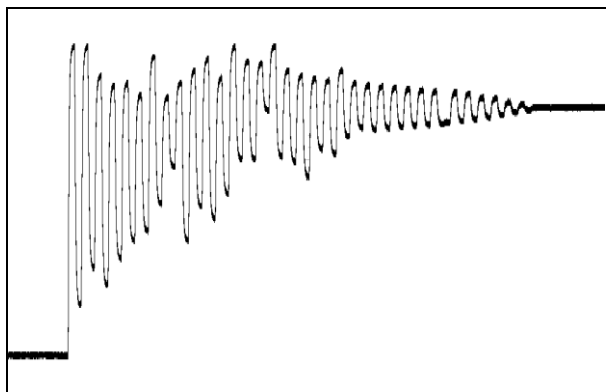
Points   Up to 120 points can be used with each Sequence.
                       Each point can have a different duration, slew rate
                       and value.

                       A new point can be inserted or deleted at any
                       stage of a Sequence. Any new points that are
                       inserted will have a value averaged from its
                       neighbors as default.
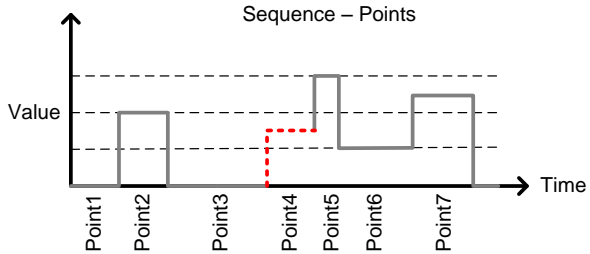
A new point is inserted after Point 3.

Loop   Sequences can be programmed to loop a number
                       of times starting from any point in the sequence.
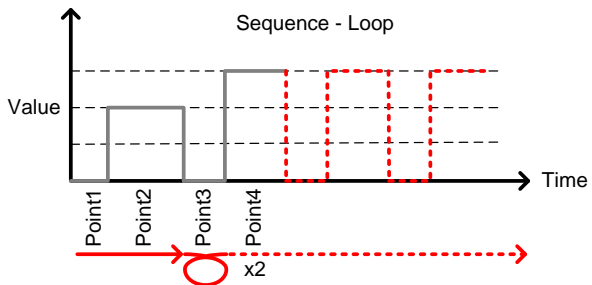
From Point3 the sequence is looped two times.

On End Of Seq. function	If more than one Sequence is programmed on the mainframe, the On End Of Seq. function will hold the load current (of the selected sequence) to a designated value until all the other sequences have finished running.
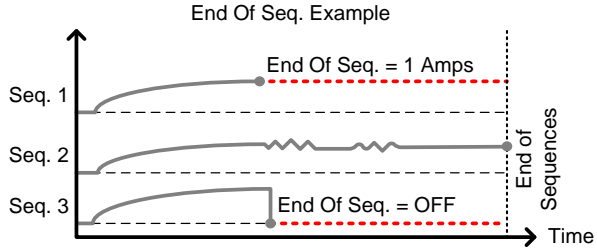
End Of Seq. Example

	In the example above, Seq. 1 will hold the load current at 1A at the end of its sequence until the last sequence has finished. Seq. 2 is the longest sequence, and as such the End Of Seq. setting is not applicable. Seq. 3 is turned off after its sequence has finished (0 amps).
Trig Out	The Trigger Out function allows a trigger sequence signal to be output from a channel via PIN 4 on Frame Link connector 1 when using Sequences. The Trig Out function is used from the Channel Duration menu.
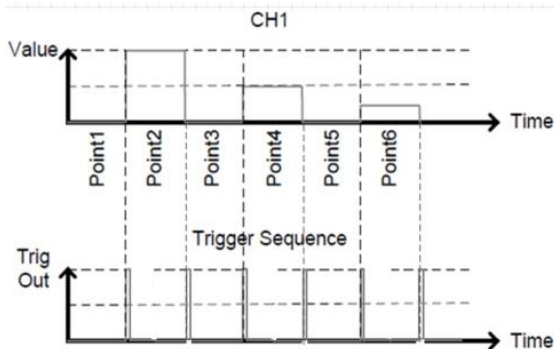
	As can be seen above, a trigger sequence signal is output for every rising edge point.

Trig In The Trigger In setting allows a sequence to start after a trigger (Trig Out) has been received via the frame link connector. The Trig In setting is used for frame linked mainframes.

Channel Duration Time Setting The Channel Duration Time Setting feature allows the point time duration of one Sequence to be imported by another Sequence. If the receiving sequence doesn't have enough points, more will be created (without values).

For example, the sequences for CH1 and CH2 are shown below. CH1 has a total of 6 points with long durations, whilst CH2 has only 2 points, looped 5 times. The points from CH2 are also significantly shorter in duration.
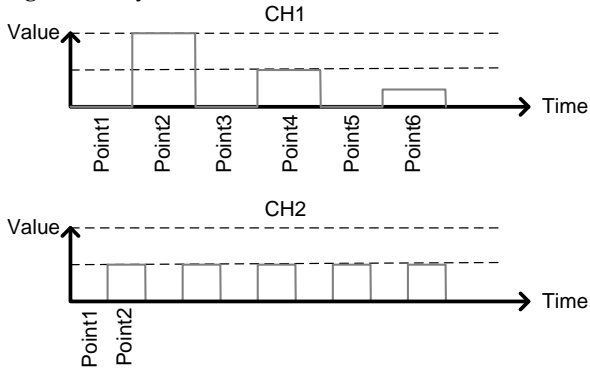
Below shows the resulting sequence when CH1 imports CH2. CH1 imports the duration time settings and number of points from CH2, but not the value data.

OCP Test Automation

Background | The OCP test function creates an automatic test to test the over current protection of power supply products. See page 167 for operation details.

This test will test to see when the over current protection of a power supply is tripped and return the measurements for the voltage and current when the over current protection was tripped. The PEL-2000A series also has a user-defined OCP setting in the event that the power supply OCP fails.

The diagram below shows an example of the OCP Test Automation function.

Parallel Dynamic Loading

Background   The PEL-2000A series of DC electronic loads
              support parallel dynamic loading. This simply
              means that when the load modules of a
              mainframe are connected in parallel and set to
              dynamic mode, they can perform dynamic tests
              synchronously following the same clock. Under
              dynamic mode, load current or resistance is
              pulsed between two preset levels. When used in
              parallel, higher powered outputs can be tested.
              This ability gives the PEL-2000A series the
              flexibility to perform dynamic tests over a wide
              range of power outputs.

              For connection details see the Parallel Load
              Connections section on page 52.

              The diagram below shows how two load modules
              are able to sink a higher load when used in
              parallel under dynamic mode.
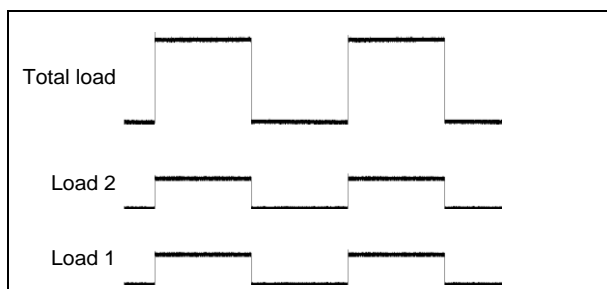
⚠ Note   The same type of load modules must be used
              operated in parallel.

Configurations Description

There are a number of different configurations for the PEL-2000A series including protection modes, operating configurations, and file system configurations. The Configuration Description section describes what the different configurations are used for and how they can be relevant to different operations.

Protection Modes

Background

The PEL-2000A series include a number of protection modes: Over Current Protection, Over Voltage Protection, Over Power Protection, Under voltage protection and Constant Power Protection.

The protection modes are useful to protect both the load modules and the DUT(s). A buzzer can be set to notify when a protection setting has been tripped. When a protection feature is activated and has been tripped then the load unit will display an alarm. The Mainframe will also display an alarm. When an alarm has been tripped the load will stop sinking current/voltage. There are three Over load protection settings: ON, OFF and Clear.

05/04/22 16 : 50		Alarm	
OCP Level	5.075 A		CH1
OCP Setting	OFF		CCDH
OVP Level	81.6 V		
OVP Setting	ON		
OPP Level	29.75 W		
OPP Setting	OFF		80V Conf
Protection	Other	Go-NoGo	Previous Menu

Over Current
Protection

When a load unit is operating in CR, CV or CP mode, the unit may need over current protection to prevent excessive current being set. Over current protection stops the load from sinking more current than its recommended limit which can cause damage to the unit.

CV Mode: OCP

CR Mode: OCP

CP Mode: OCP
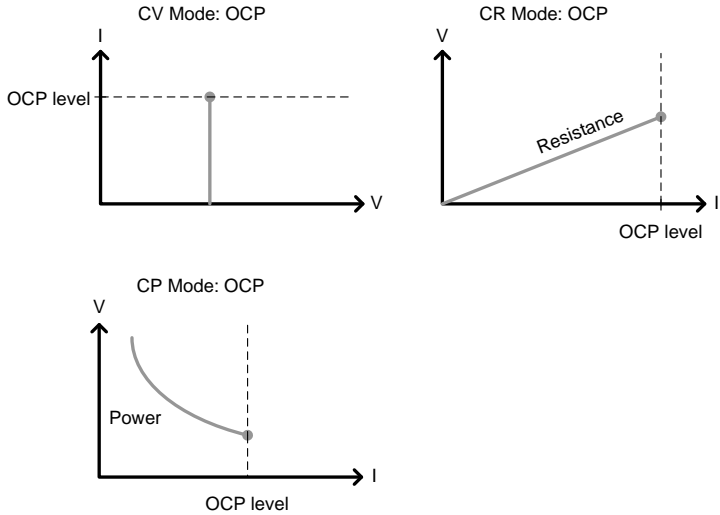
Over Voltage
Protection

Over voltage protection is used to limit the amount of voltage sunk. If the OVP trips, the PEL-2000A series load will stop sinking voltage.

CC Mode: OVP

CP Mode: OVP
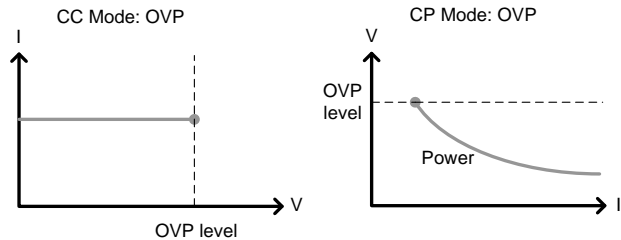
Over Power
Protection

Over power protection is used to limit the amount of power sunk. When OPP is tripped power will cease to be sunk.

Reverse voltage Protection	Reverse voltage protection prevents reverse voltage damage to the PEL-2000A series up to the specified rating. When Reverse voltage protection has been tripped an alarm tone will sound until the reverse voltage is removed.
Under voltage Protection	Under voltage protection will turn off the load when the voltage drops below a set limit.
	UVP does not work when set to "CH CONT: External".
Constant Power Protection	Constant power protection will prevent excessive power draw.

Operating Configurations

| Background	There are number of operating configuration settings. Configuration settings are for the following:
	CC Vrange, Von Voltage, Von Latch, CH Cont, Independent, load D-Time, Response settings, Step resolution settings, Short settings.
CC Vrange	CC Vrange (page 178) is used to set the voltage range as High or Low for CC mode. CC voltage range is dependent on the load module specifications.
Von Voltage	Von Voltage is the voltage limit at which the load will start to sink current. There are two operation modes for Von Voltage: Von latched: ON and Von latched: OFF.
	Latched: ON will sink current when Von has been tripped, and will continue to sink current even if the voltage drops below the Von Voltage.
	Von Latched: OFF will sink current when Von has been tripped, but will stop sinking current when the voltage drops below the Von Voltage setting.
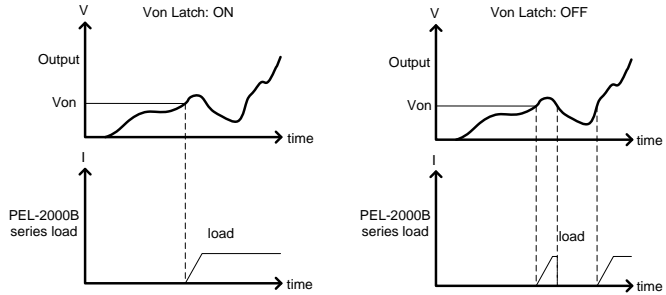
As can be seen in the diagram below, when Von-Latch is set to off, the load module will start to sink current when the Von-voltage limit has been tripped. It will stop sinking current when the output drops below the Von voltage limit.
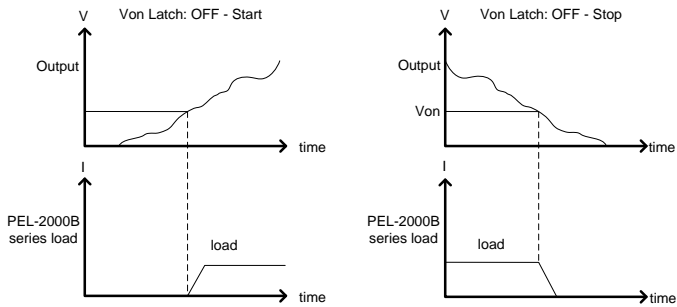
CH CONT   Channel Control. When Channel control is activated (External) it can be used to monitor the voltage and current output of the load as well as turn loads on or off remotely from the Channel Control (CH CONT) connectors located on the rear panel.

                  For more information about channel control, see external voltage control on page 87.

Independent   The Independent setting will allow the load modules to be controlled independently from the mainframe.

Load D-Time
: Load Delay time is used to delay activating a load (up to 10 seconds) after the load key has been pressed. However the Load D-Time setting will only work for loads that are initiated manually or when the PEL-2000A series mainframe is configured to Auto load (page 201) at run time.

Response
: The Response setting sets the bandwidth of the load to 200Hz (normal) or 20kHz (fast).

  If the DUT voltage range is below 1V, set the normal bandwidth to 200Hz, and set the fast bandwidth to 20kHz. If the DUT voltage range is above 1V, set the normal or fast bandwidth to 20kHz.

  The Response setting is particularly important for limiting startup current.

Step Resolution
: The current, resistance, voltage and power setting can have the step resolution configured for each channel. The step resolution refers to the step resolution of the *coarse adjustment* of these settings. The *fine adjustment* cannot be configured, see page 188 for details.

  For example if the step resolution for CCH (CC high range) is .5 A, then the resolution can be incremented in .5A steps;

$$8.0 \leftrightarrow 8.5 \leftrightarrow 9.0 \leftrightarrow 9.5$$

The step resolution parameters apply to the following:

> CCH Step – CC high range
>
> CCL Step – CC low range
>
> CRH Step – CR high range
>
> CRL Step – CR low range
>
> CVH Step – CV high range
>
> CVL Step – CV low range
>
> CPH Step - CP high range
>
> CPL Step - CP low range

Step Resolution Range

The step resolution range is dependent on the load module and the range:

Max resolution: Module dependent, see page 188

Min resolution: Module dependent, see page 188

Short Key

When short mode is on, the load unit can simulate a short circuit.

Shorting can be individually set for each channel when programming sequences.

To initiate a short circuit manually, the short key is used. It can be used at any time during an operation. It will not affect the settings. After a short circuit has finished, the load unit will resume the previous operation.

The short function can be set ON or OFF. When setting to ON, the short key is enabled. When setting to OFF, the short key is disabled.

The short key can be set to toggle or hold. When pressed in toggle mode, shorts are toggled on and off. When pressed in hold mode, the key needs to be held to short the load.

The Short Safety can be used to set the short operation mode. When setting to ON, the short

function must be used in the case of Load ON. When setting to OFF, the short function can be used directly.

⚠ Note   A short circuit may trip a protection mode if too much current is sunk.

Channel Control

Background   External channel control is used with the Channel Control connectors. Each channel control connector can activate each load, monitor voltage and current and has an external voltage reference input. The voltage and current monitors output 0~100% of the rated current/voltage as a voltage of 0~10V.
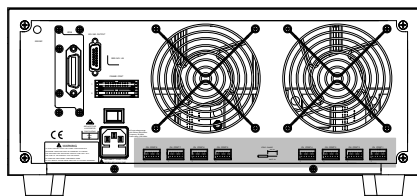
External Voltage Reference   A voltage reference of 0-10V is used to represent 0-100% of the rating voltage/current of a load module. As seen below the external voltage reference and the rating voltage/current have a linear relationship. By varying the reference voltage between 0~10V the voltage/current setting will be changed accordingly.

External Voltage Control
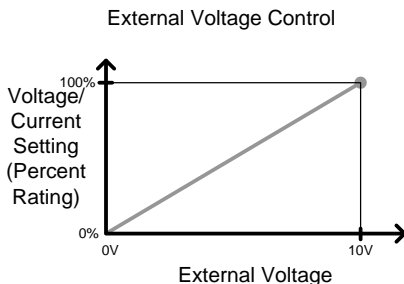
To determine the Percent Rating (voltage or current load input), use the following formula;

$$Load\ Input = \frac{External\ Voltage}{10(V)} \times Rating\quad VorA$$

Where "Rating V or A" is the rating voltage/current of the load module.

Current Monitor   The load current input can be externally monitored using the IMON pin of a channel control connector. The IMON pin outputs a voltage of 0~10V to represent the input current as a percentage (0~100%) of rating current.

Current Monitor

To determine the Current Monitor Output (IMON) , use the following formula;

$$IMON = \frac{Load\ input\ current}{Rating\quad A} \times 10V$$

Where "Rating A" is the rating current of the load module.

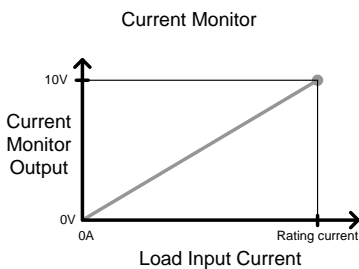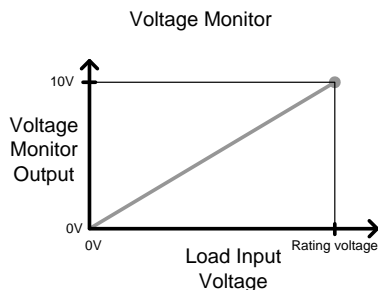Voltage Monitor   The input voltage, like the load input current can be externally monitored with the channel control connectors. The VMON pin of the channel control connector outputs a voltage of 0~10V to represent the load input voltage as a percentage (0~100%) of the rating voltage.

Voltage Monitor

To determine the Voltage Monitor Output (VMON) , use the following formula;

$$VMON = \frac{Load\ input\ voltage}{Rating\ V} \times 10V$$

Where "Rating V" is the rating voltage of the load module.

Turning on the Load   A load is turned on when Load On input is set to On (active low). A load is turned off when the Load On input is set to Off (active high).

When a load is turned on from the channel control interface, the load can be turned off from the mainframe, local module and via remote control. However the opposite is not true; when a load is turned off using the channel control interface, the load cannot be turned on via the mainframe, local module or via remote control.

For connections and configurations, see pages 56 and 259 respectively.

Interface and System

Interface

Background   The PEL-2000A series support RS232, GPIB, LAN and USB remote frame control. Only one type of connection is supported at any one time. For more information on remote control please see the GW Instek website at www.gwinstek.com or see your local distributor about the PEL-2000A series programming manual.

For connection options and configurations see the options below.

File System

Background   The PEL-2000A series is able to save and recall a number of different data types for each channel:

Presets

Memory

Setup

SEQ (Sequence)

All data types can be saved and recalled to internal memory or saved to a USB flash drive. Each channel has its own dedicated memory for

each data type. Thus files are saved/recalled for each channel and each data type.

Preset Data	Preset data can be saved into 10 memory slots for each channel. Preset data contains the mode, range, CV response speed and Go/NoGo settings.

Internal Format	P0~P9
External Format	20X0X_XX.P

Preset Contents   Preset data contains the following data;

CHAN	• Mode	• Static/Dynamic
	• Range	• CV response speed
Go/NoGo	• SPEC Test	• Entry Mode
	• High	• Low
	• Center	

Memory Data	Each channel can save up to 120 different Memory data types (M001~M120) into internal memory. Memory data contains general channel settings and is used when programming sequences. Memory data can be stored both internally and externally through the USB A port on the front panel of mainframe. Preset data and Memory data store the same contents.

Internal Format	M001~M120
External Format	20X0X_XX.M

Memory Contents   Memory data contains the following data;

CHAN	• Mode	• Static/Dynamic
	• Range	• CV response speed
Go/NoGo	• SPEC Test	• Entry Mode
	• High	• Low
	• Center	• Delay Time

SEQ Data	SEQ data contains Sequence data. SEQ data can only be saved to and from USB. SEQ refers to Sequence data, not Program sequences.	
	Internal Format	N/A (Internal buffer)
	External Format	20X0X_XX.A

SEQ Contents	SEQ data contains the following data;			
	Seq.Edit	• No. (Points)		• Value
		• Slew rate ⌐		• Slew rate ⌐
		• Duration time		
	Loop	• Repeat		• Start of Loop
		• On End Load		• CC Vrange

Setup Data	Setup data can be saved to 4 internal memory slots. Setup data contains Memory data, Program Sequence, Chain data, configuration settings and operation settings for every channel. Setup data can be saved to Internal memory or to USB.	
	Internal Format	Setup Memory 1~4
	External Format	200X0_XX.S

Setup Contents	Setup data contains the following data;		
	Program	• PROG	• SEQ (program sequence no.)
		• Memory	
		• On-Time	• Run
		• P/F-Time	• Off-Time
		• Short Channel	• Short-Time
	Chain	• Start	• Program Sequence (P01~P12)
	Run	• Active Channel (CH01~08)	
	CHAN	• Mode	• Static/Dynamic

Go/NoGo	• Range	• CV response speed
	• SPEC Test	• Entry Mode
	• High	• Low
	• Center	

Save: Internal memory	When saving data to internal memory, either the current channel or all the channel data can be saved. Not all data types can save the current channel or all the channel data.

Data Type	Current Ch	All Ch
Preset	✓	✓
Memory	✓	✓
SEQ	✓ (single save)	—
Setup	—	✓

Save: External memory	Only SEQ, Memory and Preset data can be saved for a single channel to USB. All four data types (SEQ, Memory, Setup, Preset) can save all channels to USB.

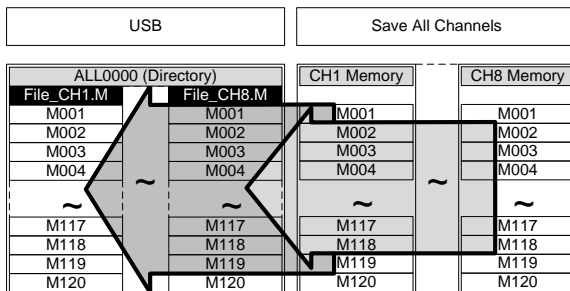| Data Type	Current Ch	All Ch
Preset	✓	✓
Memory	✓	✓
SEQ	✓	✓
Setup	—	✓

Save/Recall USB   In order to save data from a single channel to USB, data must first be saved to the internal memory. After data is saved to internal memory, all the files can be saved to USB.
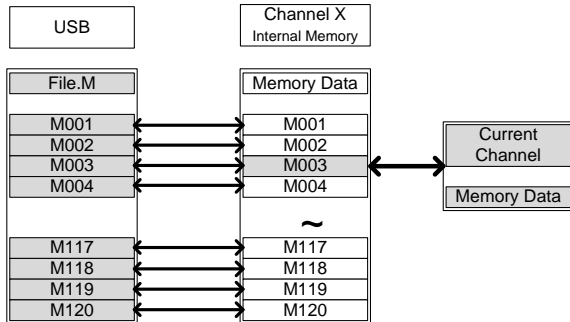
To recall saved files, the reverse is also true. Files must be recalled from the USB flash drive to internal memory. Then from internal memory the data can be recalled to each channel*.
*Excluding SEQ data.

Save/Recall All   The SEQ, Preset, Memory or Setup data can be saved from every channel into USB. SEQ, Preset and Memory data is saved into a directory (ALL0000-ALL0099) with a file for each channel, whilst Setup data is saved in a single file.

To recall saved files, the reverse is not true. Files must be recalled to each channel separately.

File Format

Current Channel	Filename format

Memory data
Preset data
SEQ data

2030R_00.M
1   2   3   4

1: PEL-2000A series Load module type:

   2020 = PEL-2020A(B)

   2030 = PEL-2030A(B)

   2040 = PEL-2040A(B)

   2041 = PEL-2041A(B)

2: Channel location or Voltage range of single channel model.

   R = Right

   L = Left

   0 = Single channel or not used

3: Save file number:

   0~99

   Incremented after each consecutive save.

4: File extension

   M = Memory data

   P = Preset data

   A= SEQ data

All Channel	Directory Format

ALL_0000
1   2

1: All Channel common directory name

2: Directory number:

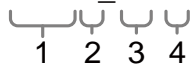   0000 ~ 0099

All Channel   File Format
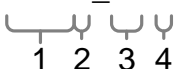
Memory data   2230R_C1.M   1: PEL-2000A series Load module
Preset data   type:
SEQ data   ⌣⌣⌣⌣ ⌣⌣ ⌣⌣
                      1   2   3   4   2020 = PEL-2020A(B)

Setup Data   20040_00.S   2030 = PEL-2030A(B)

                     ⌣⌣⌣ ⌣⌣ ⌣   2040 = PEL-2040A(B)
                      1   2   3   4
                                              2041 = PEL-2041A(B)

                                          2: Channel, Voltage range of single
                                             channel model or Mainframe
                                             indication

                                             R = Right

                                             L = Left

                                             0 = Single channel

                                          3: Channel number:

                                             C1 = CH1

                                             C2 = CH2

                                             Etc.

                                             00 = All channels (Setup data)

                                          4: File extension

   M = Memory data

                                             P = Preset data

                                             A= SEQ data

                                             S= Setup data

TUTORIALS

Local loads

Local mode operation is useful to quickly test loads using the load module control panel rather than the mainframe control panel. Local load modules can be configured to operate independently to the mainframe. This can be useful when settings need to remain unchanged on the mainframe. Note however that the local modules cannot change the modes (CC, CV, CR, CP), only the values.

Group Unit mode is not supported for local module control.
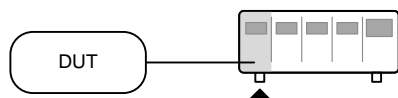
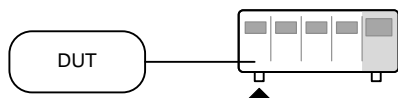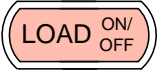| Step		Description	Details
1.	Setup	Ensure the channel load is set up as desired.	Pages 36, 44
2.	Channel selection	Ensure the correct channel or Value (A/B) is selected by using the R/L or A/B key.	Page 117
3.	Measurement Mode selection	If in CC or CR mode, Static or Dynamic mode can be selected.	CC Pages 118, 129 CR Pages 133, 135
4.	Run the Load	Press the LOAD key to start/end loading the device under test.	Page 119
Optional			
5.	Short configuration	Configure the SHORT settings.	Page 181
6.	Display	To change the display output, use the DISPLAY key.	Page 120
7.	Shorting the load	To short the load, use the SHORT key.	Page 120

8.	Independent load	The local load modules can be set to independent load.	Page 185
9.	Independent control	Slave knobs can be configured to be independent to the mainframe.	Page 206
10.	Configure Slave Knob Settings	Display Measured or Set Values with the selector knob.	Page 209

Single Channel Load

Single channel loads are used to manually test a DUT quickly or to configure channel settings for Program Sequences using the mainframe panel.
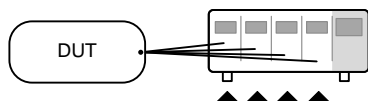

Step		Description	Details
1.	Setup	Choose the appropriate load module and make sure it is installed.	Page 36
2.	Connection	Connect the terminals to the DUT.	Page 44
3.	Channel selection	Select the load channel on the mainframe.	Page 123
4.	Measurement mode selection	Select measurement mode (CC, CV, CR, CP).	CC Page 125 CV Page 138 CR Page 131 CP Page 142
5.	Range selection	Set the range to high or low (CC, CR, CV and CP mode).	CC Page 125 CR Page 132 CP Page 145
6.	Mode selection	Choose Static or Dynamic mode (CC & CR mode only).	CC Pages 126, 129 CR Pages 133, 135
7.	Dynamic levels (CC,CR)	Set the dynamic levels, slew rate and timers. Applicable to CC & CR mode only.	CC Page 127 CR Page 133

8.	Static Values (CC, CR, CV, CP)	Set the A(B) Value, slew rate (CC, CR) and current limit (CV, CP)	CC Page 129 CR Page 136 CV Page 139 CP Page 143
9.	Go/NoGo	Set the Go/NoGo configurations, if applicable.	Page 191
10.	Protection Modes	Configure the protection modes.	Page 174
11.	Run	Activate the load by pressing the load key.	LOAD ON/OFF

Optional

| 12. | Configuration | There are number of configurations that apply to all channels. For details see the Configuration Tutorial. | Page 112 |

Parallel Load Modules

The Group Unit setting allows for a quick and easy parallel setup for load modules of the same type and rating. However, the Group Unit settings only apply for CC and CR modes.
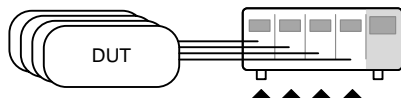

Step		Description	Details
1.	Setup	Choose the appropriate load modules and make sure they are installed. All load modules must be of the same type and rating.	Page 36
2.	Connection	Connect the terminals to the DUT.	Page 44
3.	Group Unit mode configuration	Enable Group Unit Mode and configure.	Page 195
4.	Measurement mode selection	Select measurement mode (CC, CR).	CC Page 125 CR Page 131
5.	Range selection	Set the range to high or low (CC, CR mode).	CC Page 125 CR Page 132
6.	Mode selection	Choose Static or Dynamic mode.	CC Pages 126, 129 CR Pages 133, 135
7.	Dynamic levels	For Dynamic mode, set the dynamic levels, slew rate and timers.	CC Page 127 CR Page 133
8.	Static Values	For Static mode, set the A(B) Value and slew rate.	CC Page 129 CR Page 136

9.	Go/NoGo	Set the Go/NoGo configurations, if applicable.	Page 191
10.	Protection Modes	Configure the protection modes.	Page 174
11.	Run	Activate the load by pressing the load key.	LOAD ON/OFF
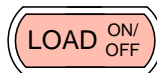
Optional

12.	Configuration	There are number of configurations that apply to all channels. For details see the Configuration Tutorial.	Page 112

Programming

When creating a Program Sequence or Chain, all channels are used at the same time unless programmed otherwise. Program Sequences use the channel settings stored from Memory Data. Program sequences are primarily used to perform a battery of pass/fail tests on DUTs.

Step		Description	Details
1.	Setup	Choose the appropriate load module(s).	Page 36
2.	Connection	Connect the terminals to the DUT.	Page 44
3.	Channel selection	Select the load channel(s) on the mainframe.	Page 123
4.	Channel setup	See the "Single channel load" tutorial to configure a single channel. Do not activate the load.	Page 101
5.	Save channel	Save the configured channel.	Page 221
6.	Multiple channels	If multiple channels need to be configured, follow steps 1-5 for any remaining channels.	
7.	Program menu	Enter the Program menu.	Page 147
8.	Configure the sequence	Configure the program.	
9.	Save sequences	Save the Program in the FUNC →Program menu.	
10.	Program Chains	If required, Program chains can be created.	Page 150

| 11. | Save Program | Save the chain in the Chain menu. | |
| 12. | Save Setup | Save everything to the internal Setup memory. | Page 226 |
| 13. | Run | Run the Program Sequence/Chain. | Page 153 |

Sequences

Sequences are used to accurately simulate loads. As each Sequence is independent, Sequences are ideally suited to test multiple output power sources.
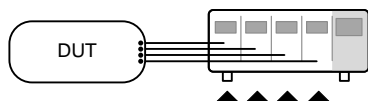
Step		Description	Details
1.	Setup	Choose the appropriate load module(s).	Page 36
2.	Connection	Connect the terminals to the DUT.	Page 44
3.	Channel selection	Select a load channel with the mainframe.	Page 123
4.	Channel setup	Create a sequence.	Page 158
5.	Sequence loop	Create a sequence loop if necessary.	Page 160
6.	Multiple channels	If multiple channels need to be configured, follow steps 1-5 for any remaining channels.	
7.	Channel Duration menu	Edit the sequence channel duration information. Ensure that the channels containing Sequences are not set to OFF.	Page 162
8.	Trigger Settings	Set Trigger Out and In channels, if appropriate.	
9.	Run	Run the Sequence(s)	Page 165

Frame Link

Frame link connections are used connect up to four slave main frames to a master main frame. When using frame link connections it is possible to perform a number of operations in parallel under the control of the master unit.
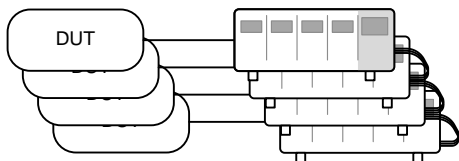
Step	Description	Details
1. Setup	Connect the mainframes together.	Page 54
2. Configure	Configure the Frame CONT to ON for all mainframes.	Page 204

At first both the master and slaves are independent. FRM (Frame Master) can be seen on the top panel of the each mainframe. When a mainframe is connected as a slave unit, the FRM icon will change to FRS (Frame Slave). The front panel keys are disabled on slave units when in slave mode (FRS).

Slave mode	FRM ⟶ FRS	
Master/Independent	FRM	

3. Program	See the tutorial sections for programming or channel configuration.	Pages 101, 103

| 4. Run | Run the loads. To run the loads, press the LOAD key on the master mainframe. To stop, press again. When the LOAD key is pressed all loads will be active. | LOAD ON/OFF |
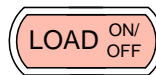
Options

5. Load Preset memory	Load preset memory on the mainframe and all frame-linked slaves.	Page 253
6. Load Setup Memory	Load setup memory on the mainframe and all frame-linked slaves	Page 252
7. Set slave to independent	Press shift + CHAN on the slave unit to enable local control on a slave unit.	LOCAL SHIFT + CHAN

FRS ⟶ FRM

⚠ Note   When a load is run or memory is recalled from the master mainframe, the slave unit will return to mainframe control.

Ensure the same firmware is installed on both master and slave mainframes.

Channel Control

The Channel Control connectors on the rear panel can be used to control and monitor the status of up to 8 channels. For more information on channel control, see page 87.
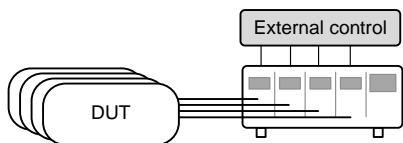
Step		Description	Details
1.	Setup	Ensure the load and PEL-2000A series mainframe is turned off.	
2.		Choose the appropriate load module(s).	Page 36
3.	Connection	Connect the terminals to the DUT.	Page 44
4.		Connect the channel control connectors on the rear panel.	Page 56 & 259
5.		Turn on the PEL-2000A series mainframe and DUT (load).	
6.	Configure	Select the Mode* and Range* via the front panel.	CC Pages 125, 125 CV Page 138
7.		Activate channel control for each channel that will be used for external control, i.e., set CH CONT to External.	Page 183

8.	Run	Run the load. Turn the load on by either outputting an active low signal to the appropriate channel control connector or control connector, or press the LOAD key on the load module or mainframe**.	Page 56 & 87
9.	Monitor	Use IMON and VMON to monitor the current and voltage of load outputs.	Page 87
10.	End	To turn the load off, output an active high signal to the channel control connector, or press the LOAD key on the load module or mainframe**.	

* Mode and Range cannot be configured via the Channel Control (CH CONT) interface. Mode and Range can only be configured via the front panel.

** The LOAD key cannot always be used to turn on/off the load. See page 87 for details.

General Configuration Options

There are number of different options for each channel. The different options are described below.

Options		Description	Details
1.	CC Vrange	Configure the CC Voltage range from high or low.	Page 178
2.	Von Voltage	Configure the Von Voltage settings.	Page 179
3.	Short Settings	Configure the short key settings.	Page 181
4.	CH CONT	Turn channel control on/off	Page 183
5.	Independent load	Turn the load module control to dependent (via mainframe) or independent control.	Page 185
6.	Delay Time	Configure the load delay time for each channel. (0-10 seconds).	Page 186
7.	Clear All Protection	Clear all the Protection Alarms.	Page 177
8.	Display	Adjust display settings.	Page 202
9.	Control type	Configure the Knob control.	Page 206
10.	Slave Knob Setting	Display Measured or Set values with the selector knob.	Page 209
11.	Alarm	Configure alarm settings.	Page 207
12.	Step resolution	Configure the step resolution. Applicable to CC high and low range, CR high and low range, CV high and low range and CP high and low rang.	Page 188
13.	Response	Configure the Response setting.	Page 191

| 14. Sound | Turn the sound on/off for the mainframe IU. | Page 202 |

OPERATION

The PEL-2000A series operation is described in the chapters below. The sections are broken down into small operations. For thorough examples on the operation of the load, please see the tutorial section on page 99.

Local Mode Operation

Each channel can be edited by its local load module. Depending on the configuration, local changes can be reflected on the mainframe. For this section all operations refer to knobs and buttons on the local load module panels, unless stated otherwise.

Selecting a Channel

|	
Background	Each channel can be individually selected by using its load module panel. Changing channels on a load module only applies to dual channel load modules.
Single Channel Panel operation	Press any key on a load module to select its channel.
Dual Channel Panel Operation	For dual channel load modules, press any key on a load module that has the desired channel. Press the R/L key to cycle between the channels on the load module. L or R will be displayed on the bottom left hand to indicate which channel (left or right side) is active on the load module.

R/L

LR

⚠ Note	On single channel modules, pressing the A/B key repeatedly will change the level from A or B when in Static mode.
	Channels cannot be selected in Group Unit Mode.
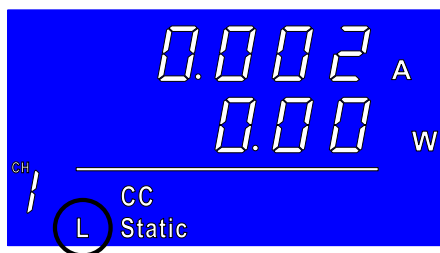
Selecting Static/Dynamic
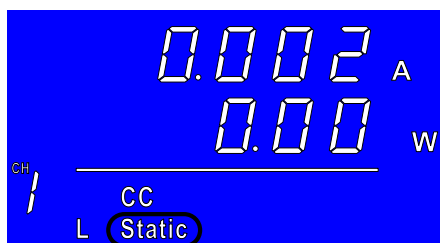
Background   Each load channel can be individually switched
                  from Static to Dynamic using the local load
                  module.

                  1. Select a channel on the load   Page 117
                     module.

Panel operation   2. Press the STATIC/DYNA. key to
                     switch from dynamic to static   STATIC/
                     mode and vice versa.   DYNA.

⚠ Note   All changes will be shown on the display and
                  depending on the configuration, reflected on the
                  mainframe.

Turning on the Load

Background   Loads can be individually selected to be turned on using local operation.

Panel operation 2. Press the LOAD key to turn on the load.

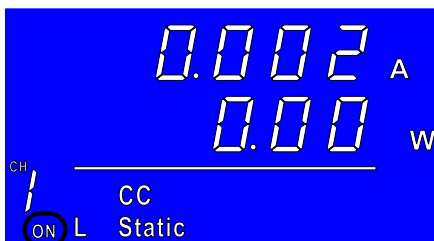⚠️ Note   When a channel load is activated, the load on symbol will be displayed under the channel number.

Range

L-ON   Left channel

R-ON   Right channel
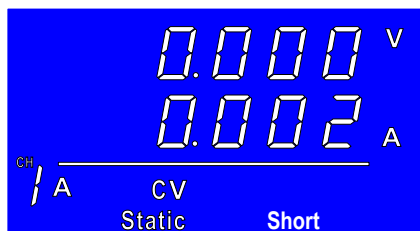
ON   Single channel

Turning the load 3. Press the LOAD key.

Shorting

Background	The Short Key is used to simulate a short circuit.

1. Configure the Short settings.   Page 181

2. Select a channel on the load   Page 117
   module.

Panel operation 3. Press the SHORT key to enter the
shorting modes.

SHORT

```
 0.000  V
 0.002  A
CH
 1 A    CV
    Static    Short
```

Shorting   4. a. Press the SHORT key (toggle
mode).

SHORT

Or

   b. Hold the SHORT key (hold
   mode).

⚠Note   The load cannot be shorted from the local load
module in Group Unit mode.

Display Output View

Background	The DISPLAY key can be used to switch the display output to different views.

Panel operation 1. Press the DISPLAY key
repeatedly to switch between the
different views.

DISPLAY

V   Voltage

A	Current
W	Power
S	Load on time.

⚠️ Note   The Display mode cannot be changed in Group Unit mode.

Editing CC/CR/CV/CP A/B Value

Background   The Slave Knob is used to edit the A Value or B Value (single channel load module) when in static mode. The Slave Knob can also operate in fine or coarse editing mode.
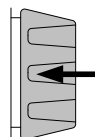
Panel Operation 1. Ensure the mode is in static   Page 118
                    mode.

2. Choose a channel (or choose A or B Value) by pressing the R/L or A/B key.

    R/L

3. Press the Slave Knob to toggle between fine and coarse editing mode.
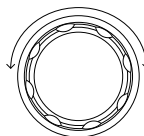   SEt_C = coarse mode.
   SEt_F = fine mode.

Fine mode example: Coarse mode example:

```
    0.000 A                     0.000 A
    SEt - C                     SEt - F
/ A  CC                      / A  CC
   Static                        Static
```

4. Turn the Slave Knob to edit the A/B Value for the selected mode.

⚠Note   When the Slave Knob is set to "Measure", the slave knob must be pressed first to display the values on the load module display.

Editing the A/B Value is not possible with this method in Group Unit mode.

Mainframe Basic Operation

For the Mainframe Basic Operation section, all operations refer to the knobs and keys on the main configuration panel, unless otherwise stated.
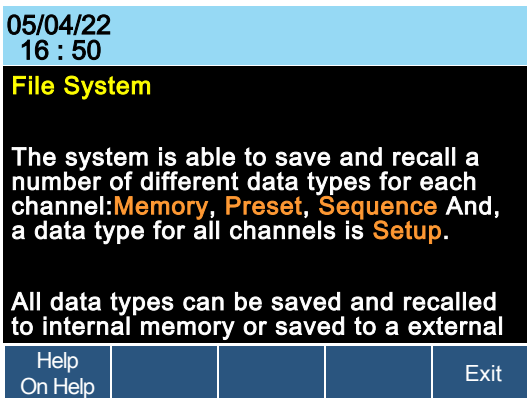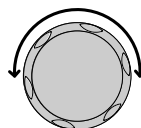
Help Menu

Background
When any function key has been pressed or when a menu has been opened, the HELP key can be used to display a detailed description.

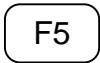1. Press a function or system key on the front panel or open a menu.

UTILITY

HELP

Help Selection
2. Press the HELP key to display the built-in help.

3. Use the scroll wheel to scroll down if necessary.

05/04/22
16 : 50

File System

The system is able to save and recall a number of different data types for each channel: Memory, Preset, Sequence And, a data type for all channels is Setup.

All data types can be saved and recalled to internal memory or saved to a external

Help On Help				Exit

A detailed description of the function or menu item is shown.

4. Press F5 to exit.

$$\boxed{\text{F5}}$$

Channel Selection

Background   There are up to 2 channels per load module,
                      depending on the model. The main display can be
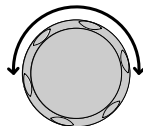   used to control each channel individually.

⚠Note   When Group Unit Mode is enabled, channel selection
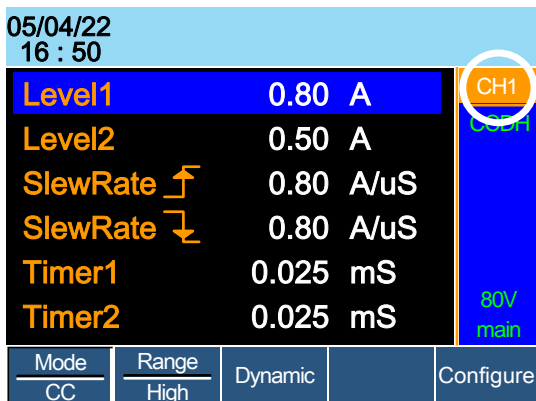   is disabled. See page 117 for details.
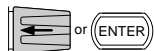
Mainframe   1. Press the CHAN button.   LOCAL
Channel selection

$$\boxed{\text{CHAN}}$$

2. Select a channel by turning the
    Variable knob.

The channel selection appears highlighted in
orange on the top right of the screen.

05/04/22		
16 : 50		
Level1	0.80	A
Level2	0.50	A
SlewRate ⤒	0.80	A/uS
SlewRate ⤓	0.80	A/uS
Timer1	0.025	mS
Timer2	0.025	mS

CH1
CCDR

80V
main

Mode	Range	Dynamic		Configure
CC	High			

3. Press the Selector knob or Enter
   to confirm.   or (ENTER)

Select CC Mode

Background   The PEL-2000A series loads operate in four different modes: Constant Current (CC), Constant Resistance (CR), Constant Voltage (CV), and Constant Power (CP).

> When a channel is active, the F1 key can be used to switch between each operating mode.

F1

Mode		Mode		Mode		Mode
CC		CR		CV		CP
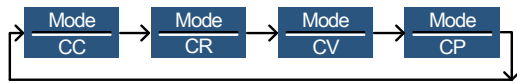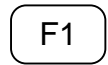
Panel Operation   1. Select a channel using the CHAN button and selector knob.

LOCAL
CHAN

2. Press F1 repeatedly until CC mode is displayed in the display panel.
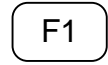
F1

Mode	Range	Dynamic		Configure
CC	High			

⚠️ Note   Changing the operating mode will only affect the current (active) channel. Other channels will not be affected by any changes.
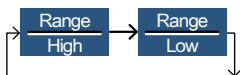
Select CC Range

Background   Constant current mode can run in high and low range. Maximum range is dependent on the load module. Some models are only high range.

Ensure the menu is in CC Mode. See page 125.

Mode	Range	Dynamic		Configure
CC	High			

Panel Operation   1. Press the F2 (Range) key repeatedly
                        until High or Low range is selected.   F2

                    ┌─────────┐   ┌─────────┐
                    │ Range │ →   │ Range │
                    │ High   │   │ Low   │
                    └─────────┘   └─────────┘

                    The range will be reflected in both the
                    bottom menu system and the Current
                    Operation Channel Status panel.

                    CC Dynamic Low   CCDL

                    CC Dynamic High   CCDH

                    CC Static Low   CCL

                    CC Static High   CCH

                                                                    80V
                                                                    main

⚠ Note   Changing the range will only affect the current
                    (active) channel. Other channels will not be affected
                    by any changes.

                    Not all load modules support dual ranges. If only one
                    range is supported, it is usually high range.

Select CC Dynamic Mode

Background   Constant current mode can be set to dynamic or
                    static mode. Dynamic mode is used to
                    automatically set varying load rates.

                    Ensure the menu is in CC Mode. See page 125.

                    ┌────────┬────────┬──────────┬─────┬──────────┐
                    │ Mode │ Range │ Dynamic │   │Configure │
                    │ CC   │ High   │   │   │   │
                    └────────┴────────┴──────────┴─────┴──────────┘

Panel Operation   1. Press the F3 key until Dynamic
                        Range mode is selected.   F3
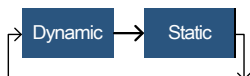
                    ┌──────────┐   ┌─────────┐
                    │ Dynamic │ →   │ Static │
                    └──────────┘   └─────────┘

Note	Changing from static to dynamic mode will only affect the current (active) channel.

Editing CC Dynamic Parameters

Background	Dynamic Constant Current Mode has two operating current levels, slew rates and timers.
	Slew rates determine the speed at which the load will change from one level to the next.
	The timers determine how long the load module/channel will stay at level 1 or level 2.
	Ensure the menu is in CC Dynamic Mode. See page 126.

Mode	Range	Dynamic		Configure
CC	High			

Parameters	Level1	0 ~ Setting Max A
	Level2	0 ~ Setting Max A
	SlewRate ⤒	Load module dependent
	SlewRate ⤓	
	Timer1	0.025 ~ 30000.0 ms
	Timer2	0.025 ~ 30000.0 ms

Note	When used in Group Unit mode, the Level1 & Level2 range is the combined rating of all the units used in Group Unit mode.

Panel Operation	1. Use the Selector knob to highlight Level1.

05/04/22		
16 : 50		CH1P
Level1	**0.80**	**A**
Level2	0.50	A
SlewRate ⬆	0.80	A/uS
SlewRate ⬇	0.80	A/uS
Timer1	0.025	mS
Timer2	0.025	mS

Mode	Range	Dynamic		Configure
CC	High			

CCDH · 80V main

2. Press the Selector knob to edit the selected level, then turn to increase or decrease the value*.

OR

Use the number pad to enter a number.

Level1   0.80 A

3. Press the Selector knob or Enter to confirm selection.

4. Repeat steps 1-3 for the remaining parameters.
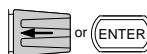
⚠Note   Level1 & Level2 can be set for both High and Low Range.

*Press Shift to toggle between coarse and fine adjustment when editing the Level1 and Level2 parameters. See page 188 for details.

Select CC Static Mode

Background   Constant current mode can be set to dynamic or
                  static mode. Static mode is for manually varying
                  the load for single channel load modules or to set
                  a static load on dual channel modules.

                  Ensure the menu is in CC Mode. See page 124.

Mode	Range	Dynamic		Configure
CC	High			

Panel Operation   1. Press the F3 key until Static mode is
                      selected.

                                                                    F3
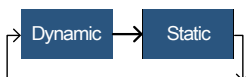
Dynamic	→	Static

⚠Note   Changing from static to dynamic mode will only affect
                  the current (active) channel.

Editing CC Static Parameters

CC Values   When using a single channel load module, Static
                  Constant Current Mode has two operating current
                  values, A&B. If a dual channel load is used, only
                  one current value is available per channel:
                  A Value.

                  If Group Unit Mode is enabled, an additional
                  parameter, Switch Value, is available to switch
                  from A Value to B Value.

                  Ensure the menu is in CC Static Mode. See page
                  129.

Mode	Range	Static	Seq.	Configure
CC	High		Edit	

Parameters	A Value	0 ~ Setting Max A
	B Value	0 ~ Setting Max A
	SlewRate ⌐ᶠ	Load module dependent
	SlewRate ⌐↓	
	Switch Value	A/B (Group Unit Mode only)

⚠ Note   When Group Unit Mode is enabled, the A Value & B Value range is the combined rating of all the units used in Group Unit Mode, see page 71.

Panel Operation   1.   Use the Selector knob to highlight A Value.

Single Channel Configuration

05/04/22 16 : 50		USB LOAD	
A Value	0.80	A	CH1 CCH
B Value	0.80	A	
SlewRate ᶠ	0.80	A/uS	
SlewRate ↓	0.80	A/uS	80V main

| Mode CC | Range High | Static | Seq. Edit | Configure |

Group Unit Mode Configuration

05/04/22 16 : 50		USB LOAD	
A Value	0.80	A	CH1P CCH
B Value	0.80	A	
SlewRate ᶠ	0.80	A/uS	
SlewRate ↓	0.80	A/uS	
Switch Value		A	80V main

| Mode CC | Range High | Static | Seq. Edit | Configure |

2.   Press the Selector knob to edit the selected value, then turn to increase or decrease the value*.

OR

Use the number pad to enter a number.
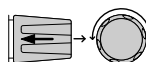
P7	P8	P9
7	8	9
P4	P5	P6
4	5	6
P1	P2	P3
1	2	3
P0	CAL	LOCK
0	.	CLEAR

A Value   0.80 **A**

3.   Press the selector knob or Enter to confirm selection.
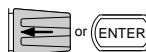
or (ENTER)

4. Repeat steps 1-3 for the remaining parameters.

⚠ Note

The last Value (A Value or B Value) that is set becomes the active setting. To swap between A Value and B Value, use the A/B keys on the local load module. This is not applicable to Group Unit mode.

For Group Unit mode, use the Switch Value parameter to switch between A and B Value.

A/B Value and rising/falling SlewRate can be set for both High and Low Range.

*Press Shift to toggle between coarse and fine adjustment when editing the A Value and B Value parameters. See page 188 for details.

Set to CR Mode

Background

The PEL-2000A series load operates in four different modes, Constant Current (CC), Constant Voltage (CV), Constant Resistance (CR) and Constant Power (CP). Constant Resistance mode will maintain a constant resistive load, using variable current and voltage levels.

When a channel is active, the F1 key can be used to switch between each operating mode.
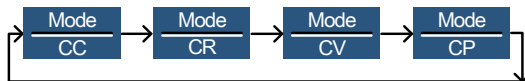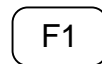
F1

Mode	Mode	Mode	Mode
CC	CR	CV	CP

Panel Operation

1. Press the CHAN button and use the selector knob to select a channel.

LOCAL
CHAN →

2. Press F1 until CR mode is displayed in the display panel.

F1

Mode	Range	Dynamic		Configure
CC	High			

⚠️Note Changing the operating mode will only affect the current (active) channel. Other channels will not be affected by any changes.

Select CR Range

Background Constant Resistance mode can run in high and low range. Range is dependent on the load module.

Ensure the menu is in CR Mode. See page 131.

Mode	Range	Dynamic		Configure
CC	High			

Panel Operation 1. Press the F2 (Range) key repeatedly until High or Low range is selected.

F2

Range	Range
High	Low
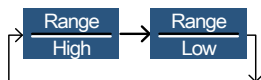
The range will be reflected in both the bottom menu system and the Current Operation Channel Status panel.

CR Static Low   CRL

CR Static High   CRH

CR Dynamic Low   CRDL

CR Dynamic High   CRDH

CH1

CRL

80V
main

⚠️Note Changing the range will only affect the current (active) channel. Other channels will not be affected by any changes.

All resistance values and slew rates are dependent on Range, i.e., A Value in low range can be different from A Value in high range.

Select CR Dynamic Mode

Background   Constant Resistance mode can be set to dynamic
                    or static mode. Dynamic mode is used to
                    automatically set varying load rates.

                    Ensure the menu is in CR Mode. See page 131.

Mode	Range	Dynamic		Configure
CC	High			

Panel Operation   1. Press F3 until Dynamic Range mode
                        is selected.
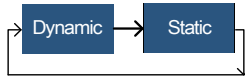
                                                                    F3

Dynamic	→	Static

⚠ Note   Changing from static to dynamic mode will only affect
                    the current (active) channel.

Editing CR Dynamic Parameters

CR levels   Dynamic Constant Resistance Mode has two
                    operating resistance levels, slew rates and timers.

                    Slew rates determine the speed at which the load
                    will change from one level to the next.

                    The timers determine how long the load
                    module/channel will stay at level 1 or level 2. See
                    the CR operating description for details about
                    slew rates and timers, page 64

                    Ensure the menu is in CR Dynamic Mode. See
                    page 133.

Mode	Range	Dynamic		Configure
CC	High			

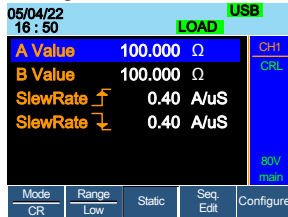| Parameters	Level1	Minimum ~ Rating Ω
	Level2	Minimum ~ Rating Ω
	SlewRate ⌐	Load module dependent
	SlewRate ⌐	
	Timer1	0.025 ~ 30000.0ms
	Timer2	0.025 ~ 30000.0ms

⚠ Note   When used in Group Unit Mode, the Level1 & Level2 range is the combined rating of all the units used in Group Unit Mode.

Panel Operation   1. Use the Selector knob to highlight Level1.
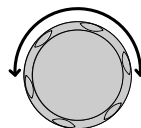
05/04/22
16 : 50

Level1	100.000	Ω
Level2	100.000	Ω
SlewRate ⌐	0.40	A/uS
SlewRate ⌐	0.40	A/uS
Timer1	0.025	mS
Timer2	0.025	mS

CH1
CRDL

80V
main

Mode	Range	Dynamic		Configure
CR	Low			

2. Press the Selector knob to edit the selected level, then turn to increase or decrease the value*.

OR

Use the number pad to enter a number.

P7 7 P8 8 P9 9
P4 4 P5 5 P6 6
P1 1 P2 2 P3 3
P0 0 CAL. • LOCK CLEAR

134
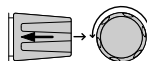
| Level1 | 100.000 | Ω |

3. Press the Selector knob or Enter to confirm selection.

or (ENTER)
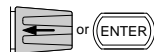
4. Repeat steps 1-3 for the remaining parameters.
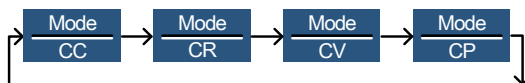
⚠️Note
Level1 & Level2 can be set for both High and Low Range.

*Press Shift to toggle between coarse and fine adjustment when editing the Level1 and Level2 parameters. See page 188 for details.

Select CR Static Mode

Background
Constant Resistance mode can be set to dynamic or static mode. Static mode is for manually varying the load for single channel load modules or to set a static load on dual channel modules.

Ensure the menu is in CR Mode. See page 131.

Mode	Range			
CC	High	Dynamic		Configure

Panel Operation
1. Press the F3 key until Static mode is selected.

F3
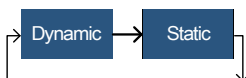
| Dynamic | → | Static |

⚠️Note
Changing from static to dynamic mode will only affect the current (active) channel.

Editing CR Static Parameters

Background	Single channel load modules have two resistance levels, A Value & B Value. Dual channel load modules have only one resistance level per channel, A Value.
	When Group Unit Mode is enabled, an additional parameter, Switch Value, is available to switch from A Value to B Value.
	Ensure the menu is in CR Static Mode. See page 135.

Mode	Range	Static	Seq.	Configure
CR	Low		Edit	

Parameters	A Value	Setting Min ~ Rating Ω
	B Value	Setting Min ~ Rating Ω
	SlewRate ⌐	Load module dependent
	SlewRate ⌐	
	Switch Value	A/B (Group Unit Mode only)

⚠ Note	When Group Unit Mode is enabled, the A Value & B Value range is the combined rating of all the units used in Group Unit Mode.

Panel Operation	1. Use the Selector knob to highlight A Value.

Single Channel Configuration

05/04/22 16:50			USB LOAD	
A Value	100.000	Ω		CH1
B Value	100.000	Ω		CRL
SlewRate ⌐	0.40	A/uS		
SlewRate ⌐	0.40	A/uS		80V main

| Mode CR | Range Low | Static | Seq. Edit | Configure |

Group Unit Mode Configuration

05/04/22 16:50			USB LOAD	
A Value	100.000	Ω		CH1P
B Value	100.000	Ω		CRL
SlewRate ⌐	0.40	A/uS		
SlewRate ⌐	0.40	A/uS		
Switch Value	A			80V main

| Mode CR | Range Low | Static | Seq. Edit | Configure |

2. Press the Selector knob to edit A Value /B Value, then turn to increase or decrease the value*.

    OR
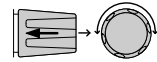
    Use the number pad to enter a number.
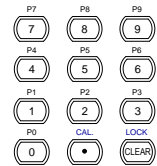
    | A Value | 100.000 | Ω |

3. Press the selector knob or Enter to confirm selection.
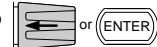
4. Repeat steps 1-3 for B Value (if applicable), rising and falling SlewRate.

⚠️ Note

The last Value (A Value or B Value) that is set becomes the active setting. To swap between A Value and B Value, use the A/B keys on the local load module (not applicable to Group Unit mode).

For Group Unit mode, use the Switch Value parameter to switch between A and B Value.

A/B Value and rising/falling SlewRate can be set for both High and Low Range.

*Press Shift to toggle between coarse and fine adjustment when editing the A Value and B Value parameters. See page 188 for details.

Select CV Mode

Background   The PEL-2000A series electronic load operates in
              four different modes, Constant Current (CC),
              Constant Resistance (CR), Constant Voltage (CV),
              and Constant Power (CP).

              CV Mode cannot be used with the Group Unit
              mode.

              When a channel is active, the F1 key can
              be used to switch between each
              operating mode.

              [F1]

Mode		Mode		Mode		Mode
CC	→	CR	→	CV	→	CP

Panel Operation   1. Press the CHAN button and use
                       the selector knob to select a
                       channel.

                       LOCAL
                       [CHAN] → ◯

                   2. Press F1 until CV mode is
                       displayed in the display panel.

                       [F1]

Mode	Range	Response		Configure
CV	High	Slow1		

⚠ Note   Changing the operating mode will only affect the
          current (active) channel. Other channels will not be
          affected by any changes.

Editing CV Parameters

Background   Constant Voltage mode can be set to a maximum
                    limit (Curr Limit). Using the current limit enables
                    limiting the current draw.

                    When using CV mode on single channel load
                    modules, two voltage levels can be set, A Value
                    and B Value. On a dual channel load module, only
                    one voltage level can be set per channel: A Value.

                    Ensure the menu is in CV Mode. See page 138.

Mode	Range	Response		Configure
CV	High	Slow1		

Parameters   A Value   0 ~ Setting Max V

                    B Value   0 ~ Setting Max V

                    Curr Limit   Load module dependent

Panel Operation   1. Use the Selector knob to highlight
                      A Value.
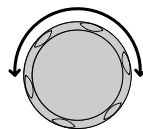
05/04/22
 16 : 50

A Value	80.00 V	CH1
B Value	80.00 V	CVH
Curr Limit	70.00 A	
		Slow
		80V main

Mode	Range	Response	IMea	Configure
CV	High	Slow1	High	

2. Press the Selector knob to edit the selected value, then turn to increase or decrease the value*.

   OR
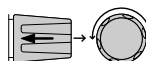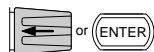
   Use the number pad to enter a number.

A Value   10.00 V

3. Press the selector knob or Enter to confirm selection.

4. Repeat steps 1-3 for the remaining parameters.

⚠ Note   The last Value (A Value or B Value) that is set becomes the active setting. To swap between A Value and B Value, use the A/B keys on the local load module.

When setting the current limit, please ensure that the current limit is within the test device's limits.

A/B Value can be set for both High and Low Range.

*Press Shift to toggle between coarse and fine adjustment when editing the A Value and B Value parameters. See page 188 for details.

Select CV Range

Background   Constant Voltage mode can run in high and low range. Range is dependent on the load module.

Ensure the menu is in CV Mode. See page 144.

Mode	Range			Configure
CP	Low			

Panel Operation   1. Press the F2 (Range) key repeatedly until High or Low range is selected.

F2

Range		Range
High		Low

The range will be reflected in both the bottom menu system and the Current Operation Channel Status panel.

CH1
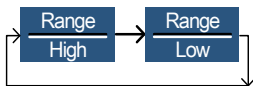
CVL

CV High Range   CVH

CV Low Range   CVL

⚠ Note   Changing the range will only affect the current (active) channel. Other channels will not be affected by any changes.

Select CV Response Speed

Background   Constant voltage mode has fast and slow response speeds. Quick current changes can induce line voltage, making it more difficult for the PEL-2000A series load to maintain a constant current. In these types of conditions, slow response speed is recommended.
Maximum current range is dependent on the load module type.

Ensure the menu is in CV Mode. See page 138.

Mode		Response		Configure
CV		Slow1		

Panel Operation   1.   Press F3 (Response) to switch between Fast and Slow response speeds.

F3

Response	Response	Response	Response
Slow1	Slow2	Slow3	Fast
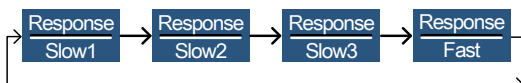
Response speed settings will be reflected in the Current Operation Channel Status panel.

CV Slow Response Slow

CV Fast Response   Fast

⚠Note

Changing the response speed will only affect the current (active) channel. Other channels will not be affected by any changes.

Select CP Mode

Background

The PEL-2000A series electronic load operates in four different modes, Constant Current (CC), Constant Resistance (CR), Constant Voltage (CV), and Constant Power (CP).

CP mode cannot be used with the dedicated Group Unit mode.

When a channel is active, the F1 key can be used to switch between each operating mode.

F1
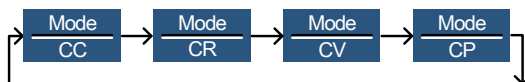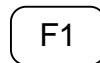
Panel Operation 1. Press the CHAN button and use the selector knob to select a channel.

2. Press F1 until CP mode is displayed in the display panel.

F1

⚠️Note Changing the operating mode will only affect the current (active) channel. Other channels will not be affected by any changes.

Editing CP Parameters

Background Constant Power mode can be set to have a maximum limit (Curr Limit). Using the current limit enables limiting the current draw.

When using CP mode on a single channel load module, two power levels can be configured, A Value and B Value. On a dual channel load module, only one power level can be configured per channel: A Value.

Ensure the menu is in CP Mode. See page 138.

Mode	Range			
CP	Low			Configure

Parameters   A Value   0 ~ Setting Max W

B Value   0 ~ Setting Max W

Curr Limit   Load module dependent

Panel Operation   1. Use the Selector knob to highlight A Value.

```
05/04/22
 16 : 50
 A Value              10.00  W      CH1
 B Value              20.00  W      CPL
 Curr Limit           7.140  A


                                     80V
                                     main
   Mode      |   Range      |    Configure
    CP       |   Low        |
```

2. Press the Selector knob to edit the selected value, then turn to increase or decrease the value *.

        OR
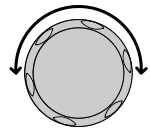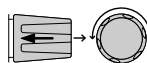
   Use the number pad to enter a number.

   A Value   10.00 W

3. Press the selector knob or Enter to confirm selection.

4. Repeat steps 1-3 for the remaining parameters.
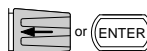
⚠ Note   The last Value (A Value or B Value) that is set becomes the active setting. To swap between A Value and B Value, use the A/B keys on the local load module.

A/B Value can be set for both High and Low Range.

When setting the current limit, please ensure that the current limit is within the test device's limits.

*Press Shift to toggle between coarse and fine adjustment when editing the A Value and B Value parameters. See page 188 for details.

Select CP Range

Background   Constant Power mode can run in high and low
                      range. The maximum range is dependent on the
                      load module. Some models are only high range.

                      Ensure the menu is in CP Mode. See page 138.

Mode	Range			Configure
CP	Low			

Panel Operation   1. Press the F2 (Range) key repeatedly
                      until High or Low range is selected.   F2

Range	→	Range
High		Low
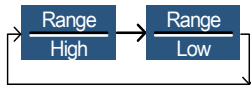
                      The range will be reflected in both the
                      bottom menu system and the Current   CH1
                      Operation Channel Status panel.   CPL

                      CP High Range   CPH

                      CV Low Range   CPL

/!\ Note   Changing the range will only affect the current
                      (active) channel. Other channels will not be affected
                      by any changes.

                      Not all load modules support dual ranges. If only one
                      range is supported, it is usually high range.

Creating a Program Sequence

Background   The PEL-2000A series has a total of 12 different programs and 10 sequences to each program. That totals to 120 different configurations.

Each Sequence in each program uses the settings saved from Memory Data (Memory MXXX). Memory Data contains settings such as the mode and range for each channel. Different Sequences can use the same Memory Data repeatedly. Each Sequence loads all channels at the same time, unless programmed otherwise.

Sequence1	
CH1 M001	Run
CH2 M001	On-Time
CH3 M001	Off-Time
CH4 M001	Short-Time
CH5 M001	P/F-Time
CH6 M001	Short CH1
CH7 M001	~
CH8 M001	Short CH8

Sequences are run sequentially to create a Program. There are 10 Sequences in each Program.
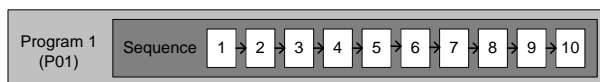
If less than 10 Sequences are desired for a Program, any additional Sequences can be skipped (not run).

Sequence 2 & 3 are skipped.
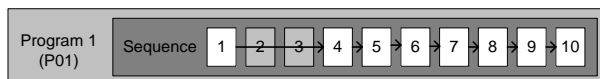
Parameters	Memory	M001~M120
	Run	Skip-Auto-Manual
	On-Time	0.1 ~ 60.0 seconds
	Off-Time	Off – 0.1 ~ 60.0 seconds
	P/F Time	Off – 0.1 ~ (On-Time+Off-Time)-0.1
	Short-Time	Off – 0.1 ~ On-Time
	Short Ch	Off – 1~ 8 (CH1~CH8)

⚠️Note   Before a program can be created, the settings for each sequence for every channel that is to be used in the program must first be pre-configured and saved into Channel Memory (MXXX).

Sequence Settings
1. Press the FUNC key then F1 (Program) to access the Program menu.

[FUNC] → [F1]

```
05/04/22                          USB
 16 : 50                       LOAD

       Timing Edit for Program
        PROG:   01   SEQ:  01

Memory:  M001   Off-Time:      Off
Run:          Skip   P/F-Time:      Off
On-Time      0.1   Short-Time:   Off
Short Ch:  1    2    3    4    5    6    7    8

  Chain     Active     Save     Recall
           Channel              Default
```
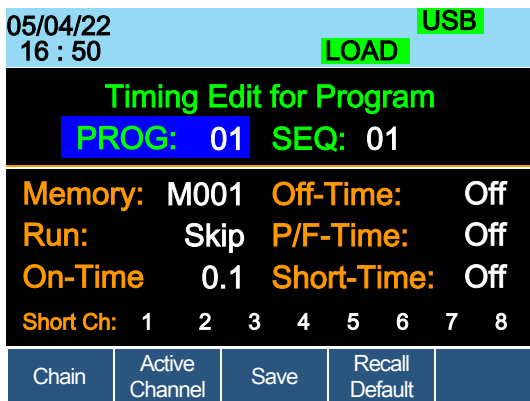
2. Use the Selector Knob to highlight PROG:.
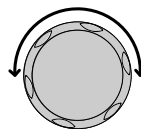
3. Press the selector knob to edit
   PROG:, then turn to select the
   program number.

<div align="center">OR</div>
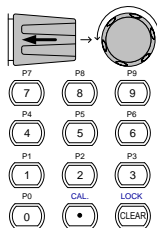
   Use the number pad to enter a
   program number.

   Program: 01 ~12

4. Press Enter or push the selector
   knob to confirm.
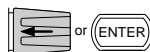
Repeat steps 2-4 to choose the sequence number
(SEQ:).

   Sequence: 01 ~ 10

5. As sequences are executed sequentially, start at
   SEQ: 01.


```
05/04/22                          USB
  16 : 50                      LOAD
        Timing Edit for Program
        PROG:   01   SEQ:  01

Memory:  M001   Off-Time:      Off
Run:         Skip   P/F-Time:      Off
On-Time      0.1    Short-Time:  Off
Short Ch:  1   2   3   4   5   6   7   8
```

| Chain | Active Channel | Save | Recall Default | |
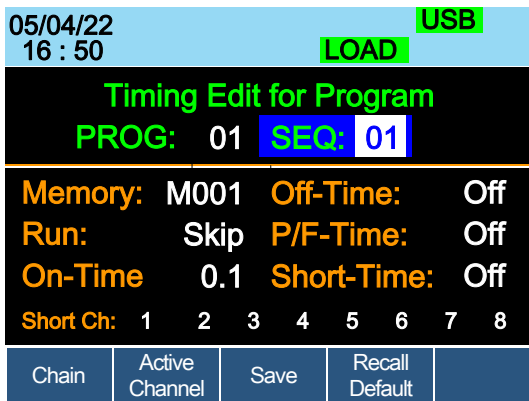
6. Repeat steps 2-4 to configure the following for
   the current Program Sequence:

   Memory: M001 ~M120

   Choose which Memory data will be used
   for the sequence. M001 ~ M120

   Run: Skip – Auto - Manual

Choose whether to run the sequence in the program automatically, skip the sequence or manually start the sequence.

On-Time: 0.1 ~ 60.0 seconds

Determines how long the sequence will run for (seconds).

Off-Time: Off – 0.1 ~ 60.0 seconds

Sets how long the sequence will stay off for (in seconds) between each sequence. Assuming Short time is not set to OFF, Off-Time will always run after On-Time.

Short Time: Off – 0.1 ~ On-Time (seconds)

Determines how long a short circuit will last (seconds). However the shorting time cannot be longer than the On-time. Short Time will start at the same time as On-time.

P/F Time: Off – 0.1 ~ (On-Time+Off-Time)-0.1 (seconds)

The Pass(P)/Fail(F) Delay Time can be set to 0.1 seconds less than the total test time. The total test time is defined as:

On-Time + Off-Time (seconds)

If Go/NoGo is turned on but the pass fail time is off, then Go/NoGo test will continue, but there will not be a specified pass/fail time window.

Short Channel: Off – 1~ 8 (CH1~CH8)

Each channel can be individually set to simulate a short circuit (CH1~8) or can have shorting disabled (Off). When Short Channel is set to Off, the channel will ignore the execution of Short-Time.

7. Repeat the above steps for all ten sequences for the same (current) program.

Save Sequence

8. Press F3 (Save) to save all the sequence data for all of the program.

[F3]

⚠️ Note

Note the program data is not yet saved into Setup Memory. If you wish to save the Program to Setup Memory see page 227.

Recall Default

9. To recall the Default Program settings, press F4.

[F4]

⚠️ Note

If the Default is recalled, all data will be lost. This does not include the internal Setup Memory. To see the default settings, see page 307.

Timing Diagram for Single Step

Below is a timing diagram of a single step in a program.

P/F Start Test Time (fixed)   P/F End Test Time (fixed)
            ↓   ↓
    ⊬—0.06s—⊁——P/F Time——⊁—0.04s—⊁
    ⊬——Short-Time——⊁
Start of Step ⊬——On-Time——⊁——Off-Time——⊁ End of Step
    ⊬————————Step test time————————⊁
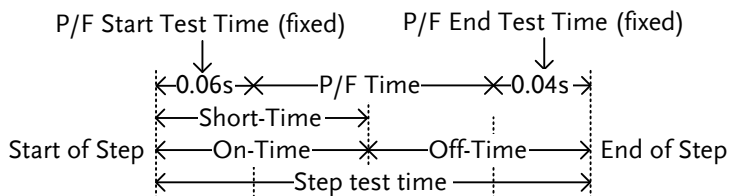
Program Chains

Background

On the PEL-2000A, there are up to 12 different programs containing 10 sequences.

If 10 sequences in a Program Sequence prove to be inadequate for testing, the PEL-2000A series can chain different programs together, effectively making a larger Program Sequence.

Unlike Program Sequences, Program Chains do not need to be run in numerical order. Up to 12 Program Sequences can be chained together

Program Chain	Program	12	2	3	4	11	1	5	6	7	8	9	10
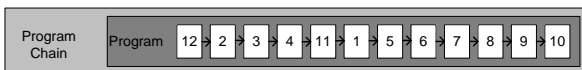
Panel operation   1. Create 1 or more Program   Page 142
                      Sequences.

                   2. If Program Sequences were   Page 227
                      created in a different session,
                      ensure the programs have been
                      loaded from Setup Memory.

                   3. Press the FUNC key, then
                      Program (F1), followed by Chain
                      (F1).

```
05/04/22                          USB
 16 : 50                    LOAD

            Start  P01
         Sequence Chain Set
           P01    →    Off
           P02    →    Off
           P03    →    Off
           P04    →    Off

   Edit              Save   Recall   Previous
   Start                    Default   Menu
```
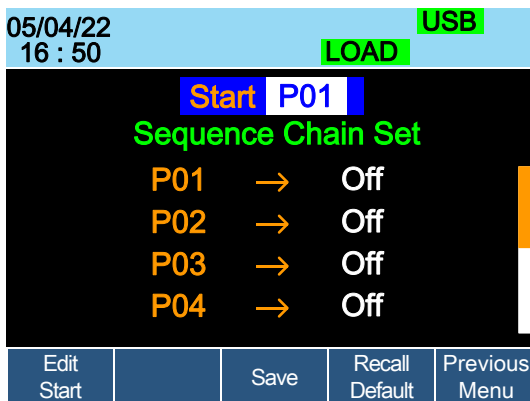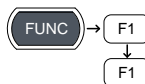
                   4. Press F1 (Edit Start) and use the
                      selector knob to edit Start and
                      confirm which Program Sequence
                      (PXX) will start the program
                      chain. Any Program (P01~P12)
                      can be used to start a Program
                      Chain.

                   5. Use the Selector knob to scroll
                      down to P01 (Program 1).
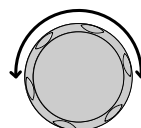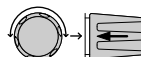
6. Use the Selector knob to choose the program that will execute after P01 (P02~P12).
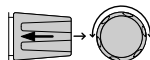
OR

Select (Off) to end the Program Chain after (P01).

OR

Select (P01) to execute after P01, this will create a continuously looping Program Chain.

P01 → Off – P01~P12

7. Repeat the above procedure to P02~P12 to complete the program chain.

The Program Chain ends at the first Program (PXX) that is followed by Off. It is possible to create continuously looping program chains.

Save Program Chain

8. Press F3 (Save) to save the program chain.

F3

⚠ Note

The Program Chain data is not yet saved into Setup Memory. If you wish to save the Program Chain to Setup Memory see page 225.

Recall Default

9. To recall the Default program chain, press F4.

F4

⚠ Note

If the Default is recalled, Start will revert to P01 and all program sequences will be set to Off.

Previous Menu

10. Press F5 (Previous Menu) to return the Sequence menu.

F5

Running a Program

Background   Once a Program Chain/Program Sequence has
                    been created, it can be executed. As Program
                    Sequences apply to all the channels, any channels
                    that don't need to be active (load off) can be
                    programmed in the Active Channel menu. At
                    Default, all channels are set to (load) Off.

                    EXT will be shown next to any channels set to
                    external channel control.

Panel operation   1. Create 1 or more Program   Page 142
                        Sequences.

                    2. Create a Program Chain.   Page 150

                    3. Press the FUNC key, Program   FUNC → F1
                        (F1) and Active Channel (F2).   ↓
                                                                  F2
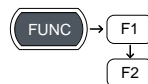
                    Channel 1 (CH01) will be highlighted. Note CH1 has
                    CH CONT set to External

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16 : 50		LOAD

Active Channel for Program Mode

CH		Active	
01	→	OFF	EXT
02	→	OFF	
03	→	OFF	
04	→	OFF	

Prog Off		Save	Recall Default	Previous Menu
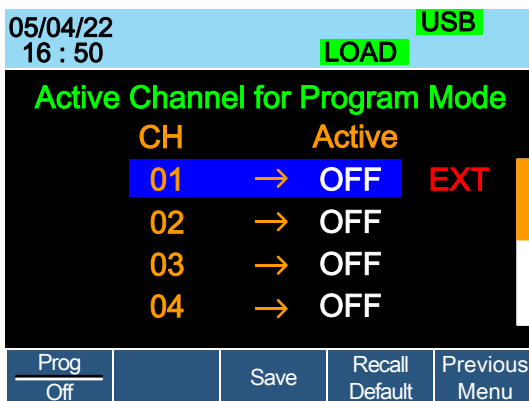
                    4. Edit the channel using the
                        Selector knob.
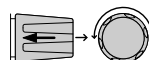
CH 01~08: ON (activate channel) – OFF (not activated)

5. Press Enter or push the selector knob to confirm the selection.

6. If needed, repeat steps 4-5 for the remainder of the channels.

⚠Note   If all channels are Active OFF, a program cannot be run as there will be no channels active.

Save Program   7. To save press F3.

F3
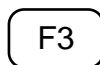
Recall Default   8. To recall default settings press F4

F4
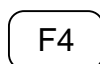
⚠Note   If the Default is recalled, all channels will revert to Active OFF.

Previous Menu   9. Press F5 (Previous Menu) to return to the Sequence menu.

F5
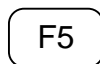
Turn Program On/Off   10. Press F1 (Prog) to turn On or Off the current Program.

F1
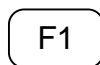
Pressing F1 will cycle from Program On to Off.

| Prog Off | → | Prog On |
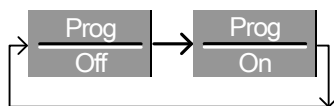
11. PROG will appear on the mainframe status panel when the program is turned on.

05/04/22   USB
 16 : 50   PROG

Run Program   12. Press the load key on the mainframe to start the Program.

LOAD ON/OFF
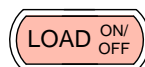
13. The Run Program screen appears, and the PROG icon turns orange.

G⫣INSTEK

```
05/04/22                        USB
 16 : 50                    PROG
Run Program
     Program No:         01
     Seq (Memory)      10(001)
CH: 1    2    3    4    5    6    7    8
     GO  NG GO GO
```

| Stop | Next | | | |
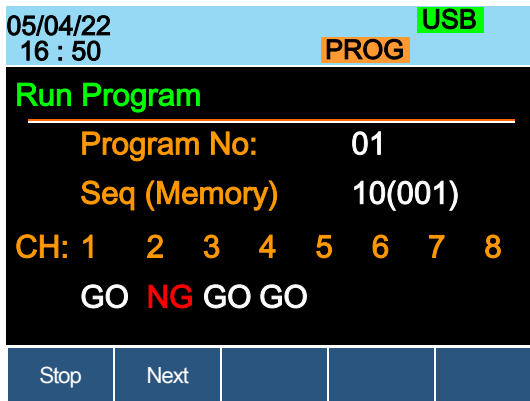
As each sequence or program is completed the screen will update to display the active sequence/program. Notice that if a channel has been set up with Go/NoGo limits, a pass (GO) or fail (NG) will be displayed on the main display as well as the local load module display.

⚠Note

If the Active = OFF for all the channels then "No Active Channel" will be displayed instead of channel numbers.

```
           19.008  V
            0.009. A
CH
 1  A  CC              GO
      Static
```
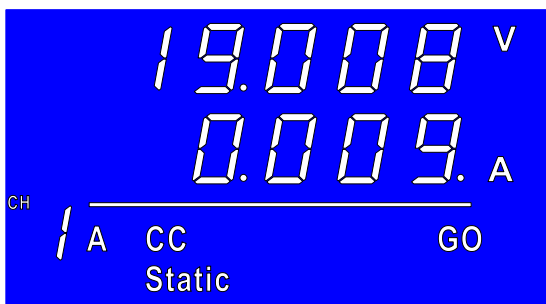
Each active load module will display the output as the program runs.

14. If Run was configured to manual in any of the program sequences, press F2 (Next) to continue the program sequence, otherwise the program will continue automatically.

F2

15. Press F1 (Stop) at any time to abort the program when it is running.

F1

05/04/22			USB
16 : 50		PROG	

CH:	1	2	3	4
	PASS	FAIL	PASS	PASS

| Detail | | | | Exit |
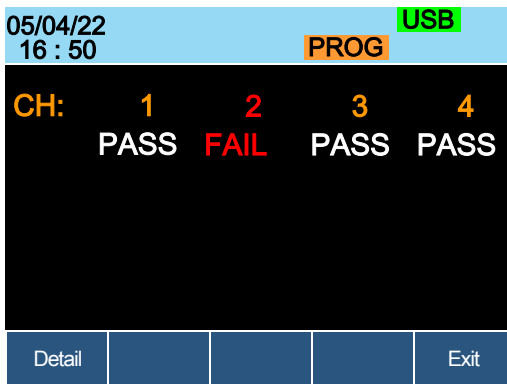
When the program has finished, the physical channels that have run will be displayed, a PASS or FAIL will be displayed if Go/NoGo testing has been set.

16. When the program has finished, press F1 to see any result details.

F1

05/04/22		USB
16 : 50	PROG	

Channel

P	S	1	2
1	1	G	N
1	2	G	N
1	3	G	N
1	4	G	G

| | | | | Exit |
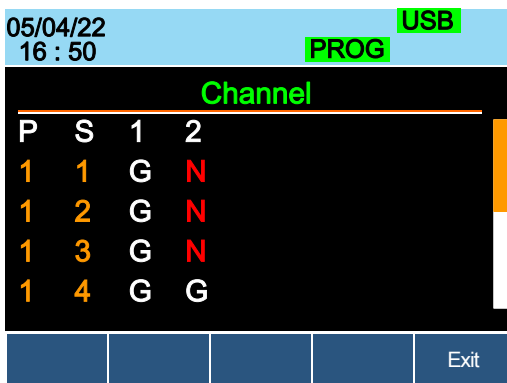
The Program (P) and Sequence (S) numbers for the Program are displayed on the left hand side and the Go/NoGo (G/N) results are displayed on the right hand side for each channel in the program.

Use the Selector knob to scroll down to view the remainder of the list if necessary.
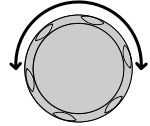
17. Press F5 to exit at any time.

F5

Upon exiting, the previous menu before running the program will load.

Edit Sequence

Background	The Sequence function can be configured to create a unique load profile to accurately simulate loads in real time for single or multiple loads. Sequence can only be used with CC static or CR static modes. For details see page 76.
	Each Sequence is composed of a number of points with customizable current/resistance, slew rate and duration times. Each sequence can be looped an infinite amount of times. Sequences are only applicable for CC (Static) and CR (Static) modes.
⚠ Note	The sequence function should not be confused with program sequences. They are not the same. Program sequences cannot be used with the Sequence function and vice versa.

Parameters		
	Value	Setting Min ~ Setting Max Ω/A
	SlewRate ⌐	Load module dependent
	SlewRate ⌐	
	Duration Time	0.000025 ~ 60,000 seconds

Panel operation		
	1. Choose a channel and mode.	Page 123, 125
	2. Press the CHAN key, F4 (Seq. Edit) to enter the Sequence Edit menu.	FUNC → F4

05/04/22
16 : 50

USB
LOAD

NO. 001 Point

CH1
CCH

Value	0.00 A
Duration Time	0.000025 S
SlewRate ⤒	2.80 A/uS
SlewRate ⤓	2.80 A/uS

80V
s_edit

| Add Point | Delete Point | | Loop | Previous Menu |
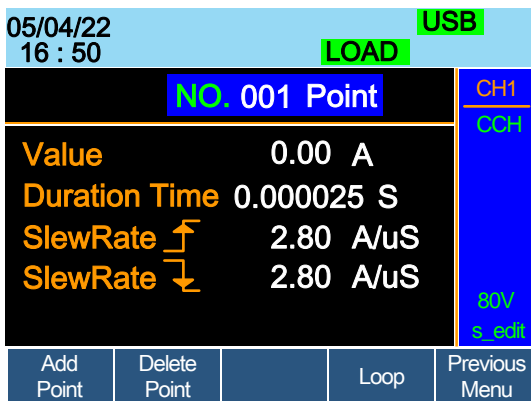
3. Use the Selector knob to highlight Value.
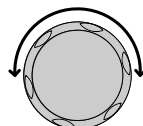
4. Press the Selector knob to edit the Value, then turn to increase or decrease the value.
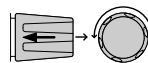
OR

5. Use the number pad to enter a number.

Value   0.800 A

6. Press the Selector knob or Enter to confirm selection.
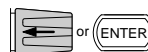
7. Repeat for rising and falling Slew Rate and Duration Time.

Add Point

8. To add an extra point after the current point, press Add Point (F1).

F1
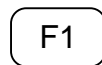
Range   001~120

Note	Add Point will insert a new point directly after the current point. The value of the current/resistance of the inserted point will be the average of the point before and after. All other settings will remain unchanged.
Delete Point	9. To delete the current point, press Delete Point (F2). F2
Edit previous point	10. Use the selector knob to change the current point number.
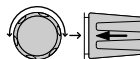
<div align="center">001 Point</div>

Note	The Point number can only be changed if more points have already been added.
Save Sequence	11. Press Save (F3) to save the sequence. F3
Note	The save icon will only appear after a change has been made in the menu.

Create Sequence Loop

Background	Sequences can be looped a number of times. The loops can be started at any point in the sequence. The Start of Loop function determines which point will start each repeating loop.
	The On End of Seq. function will hold the load current (of the selected sequence) to a designated value until all the other sequences have finished running.
	CC Vrange sets the range in CC mode for Sequences. See page 76 for more details.

Ensure the menu is in the Seq. Edit menu and that a sequence has been created. See page 158

Add Point	Delete Point		Loop	Previous Menu

Parameters	Repeat	1~9999/Infinity (0)
	Start of Loop	001~ last point
	On End of Seq.	OFF / Setting Min ~ Setting Max
	CC Vrange (CC mode only)	High/Low

Panel operation
1. Press Loop (F4) to enter the Loop menu.

F4

05/04/22		USB
16 : 50		LOAD
Repeat	0005 Times	CH1
Start of Loop	001 Point	CCH
On End Of Seq.	OFF	
CC Vrange	High	
		80V
		s_loop
	Save	Previous Menu
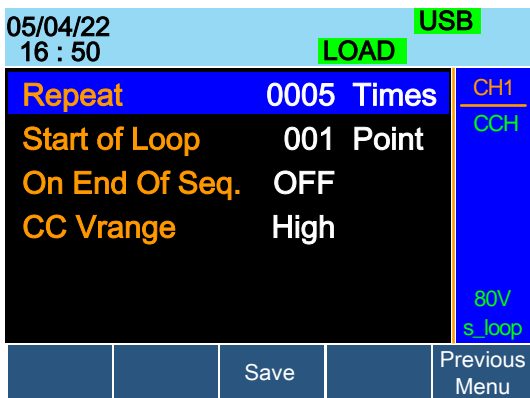
2. Use the Selector knob to highlight Repeat.
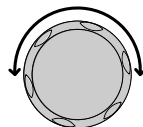
3. Press the Selector knob to edit Repeat, then turn to increase or decrease the value.
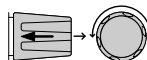
OR

4. Use the number pad to enter a number.

Select 0 to choose infinity.

| Repeat | 0005 | Times |

5. Press the Selector knob or Enter to confirm selection.
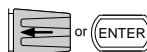
6. Repeat for the remaining parameters.

Save Loop   7. Press Save (F3) to save the loop.

F3
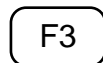
## Channel Duration Time Settings

Background   Each sequence can have the timing duration data of another sequence. For example CH1's sequence can import the timing duration settings of CH2's sequence.

This is useful to quickly compare two different loads to the same timing characteristics. See page 76 for more details.

Each channel's sequence can be turned off by configuring the channel Setting to OFF. If a channel uses the same channel number, i.e. CH 01 → 01, then the duration time settings will not be altered for that channel.

At least one channel must output a Trigger Sequence Signal via PIN4 of the first frame link connector (master) if a sequence is run. For more details see page 76.

The Trigger In signal is used to start any sequence that has TRIG set to IN. The trigger input signal is input via PIN4 of the first frame link connector (slave). For more details, see page 76.

Any channels with channel control (CH CONT) set to external will be shown on the right side as EXT. See page 183 for details on setting channel control.

Parameter	CH 01~08 Setting OFF ~ maximum channels
	CH 01~08 TRIG IN , OUT , IN/OUT, OFF

Ensure at least one sequence has been created and saved. Page 158

Panel operation
1. Press FUNC, then Sequence (F2) to enter the Channel Duration Time menu.

FUNC → F2

05/04/22   USB
 16 : 50   LOAD

Channel Duration Time Setting

TRIG	CH		Setting	
IN	01	→	OFF	
OFF	02	→	OFF	EXT
IN/OUT	03	→	OFF	
OFF	04	→	OFF	

Seq. Off	Define TRIG OUT	Save	TRIG In Channel	TRIG In Off
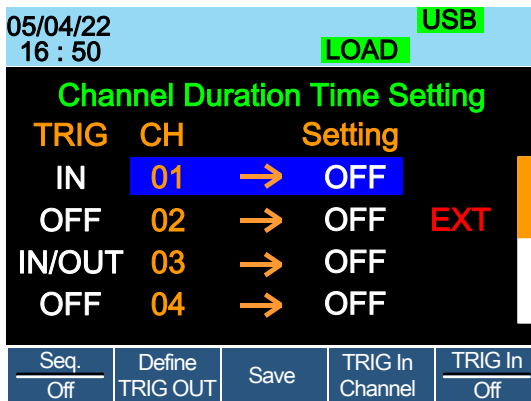
⚠ Note
CH3 is set to TRIG OUT, whilst CH1 & CH3 are set to TRIG IN. CH2 has no trigger settings and has CH CONT set to external.

2. Use the Selector knob to highlight a channel.
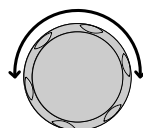
3. Press the Selector knob to edit the channel, and then turn to choose which channel's Duration Time Setting to import.
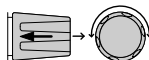
Range	Ch 01~08 / OFF

4. Press the Selector knob or Enter to confirm selection.
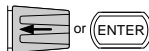
Trigger Out Channel

5. Press Define TRIG OUT (F2) if you want the currently selected channel to output the Trigger sequence signal.

F2
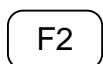
One channel must be set as the TRIG OUT channel.

Trigger In Channel

6. Press TRIG In Channel (F4) to allow the current sequence to be triggered with the Input trigger.

F4
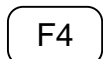
Trigger In On/Off

7. To turn the Input trigger source on, press Trig In (F5).

F5

8. Repeat the above steps for any other remaining channels.
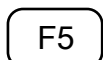
Save settings

9. Press Save (F3) to save the settings.

F3
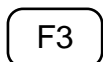
Run Sequence

Background	Like Programs, Sequences must be turned "ON" before they can be run.
	When running a Sequence, the front panel function keys, number pad, operation keys and selector knob are disabled for the specific channel(s). The load module panel is also disabled (bar the display key) for the specific channel.
	Channels that do not have a Sequence can still be edited by changing channels via the CHAN key or by using the local load module.
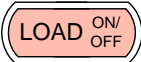
	Ensure at least one Sequence has been created and saved.	Page 158
	Ensure the Channel Duration Time Settings have also been configured and that no Sequence (CH01~08) that you wish to run are set to OFF.	Page 162
Panel operation	1. Press FUNC, then Sequence (F2) to enter the Channel Duration Time Setting menu.	FUNC → F1

05/04/22 USB
16 : 50 LOAD

Channel Duration Time Setting

TRIG	CH		Setting
OUT	01	→	01
OFF	02	→	02
OFF	03	→	OFF
OFF	04	→	OFF

Seq. Off	Define TRIG OUT	Save	TRIG In Channel	TRIG In Off
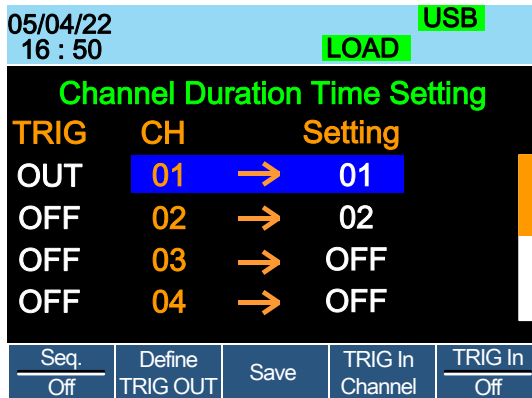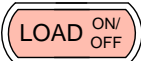
2. Press Seq. (F1) to turn on the
    Sequences.

    | F1 |

3. SEQ will be displayed on the Mainframe Status
    panel.

    | 05/04/22   USB |
    | 16 : 50   SEQ |

4. Press the LOAD key to run all the
    Sequences. If a channel has TRIG
    set to IN, that channel will now
    wait for a trigger before running.

    | LOAD ON/OFF |

5. Run SEQ Mode will be displayed on the
    bottom of the display for the specific channels.
    On the Mainframe Status panel, SEQ will turn
    orange.

    | 05/04/22   USB |
    | 16 : 50   SEQ |
    | **Channel Duration Time Setting** |
    | TRIG   CH   Setting |
    | OUT   01 →   01 |
    | OFF   02 →   02 |
    | OFF   03 →   OFF |
    | OFF   04 →   OFF |
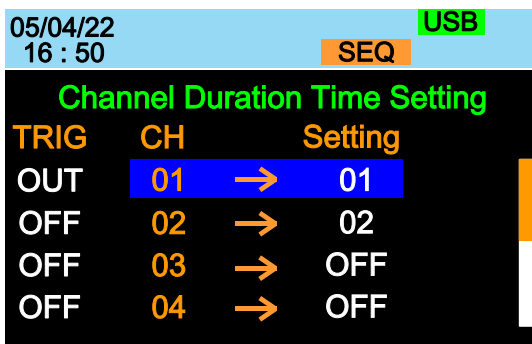
    Run SEQ Mode

Stop the load   6. Press the LOAD key again or wait
                        for the Sequence (if not infinitely
                        looped) to end/stop the load.

    | LOAD ON/OFF |

Turn off SEQ   7. Press Seq. (F1) to turn OFF the
                        Sequence(s) when the load is not
                        running.

    | F1 |

⚠Note   All UI keys/knob will be disabled for all channels that
             run a Sequence, bar the function keys and R/L keys.

OCP Test Automation

Background   The OCP test function creates an automatic test to
                  test the OCP of power supply products.
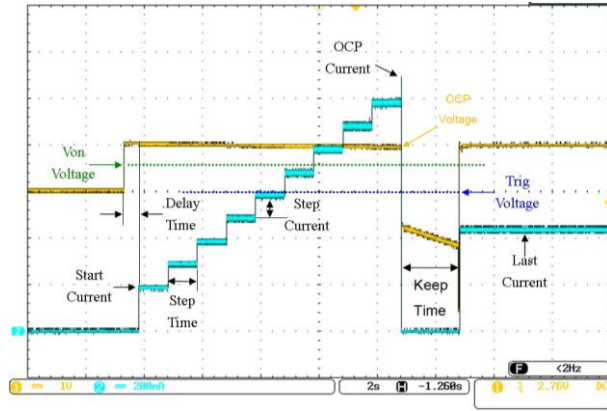
Parameters   Active Channel   Applies the setting to the
                                          load channel.

                  Range   High(CC Mode High) or
                                          Low(CC Mode Low)

                  Start Current(Start C) Starting current value for
                                          the test.

                  End Current(End C)   The current value that will
                                          end the test. The value
                                          must be higher than the
                                          OCP value of the DUT you
                                          are testing. This parameter
                                          is used as a fail-safe for if
                                          the over current protection
                                          of the DUT fails.

                  Step Current(Step_C)   Sets the step resolution of
                                          the current.

Last Current(Last_C)	Sets the final current value after OCP has been tripped. This is the steady-state current draw after the OCP has been tripped.
Step Time(Step_T)	Sets the execution time of each step. (50mS to 1600S)
Delay Time(Delay)	The OCP testing delay time. Sets the how long to delay starting the test after the Load On key has been pressed. (0 ~ 160S)
Trig Voltage(Trig_V)	Sets the voltage trigger level needed see whether the power supply OCP has been triggered. When the power supply OCP has been triggered, its voltage output will drop. The voltage trigger level is used to test to see if the voltage output has been drop.
Keep Time(Keep_T)	Set the how long to enter the Last Current after detect the OCP.(0~160S)

⚠️Note

This mode can only be used under CC mode.

Panel operation

1. Press the FUNC key, F4 (OCP) to enter the OCP Test Automation menu.   FUNC → F4

05/04/22	FRM	USB
16 : 50		SEQ

OCP Function		Chan: 1
Range: High	Step_T:	0.05
Start C: 0.000	Delay:	0.000
End C: 71.400	Trig_V:	0.0000
Step_C: 0.002	Keep_T:	0.000
Last_C: 0.000		

OCP On	Active Channel			

2. Use the Selector knob to highlight the parameter you want to edit.
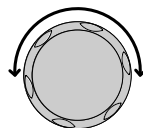
3. Press the Selector knob to edit the parameter, then turn to increase or decrease the value.
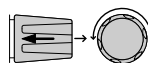
OR

Use the number pad to enter a number.

4. Press the Selector knob or Enter to confirm selection.
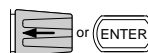
5. Repeat steps 2 -4 for all the parameters.

Save the OCP Test Automation Settings

6. Press Save (F3) to save the OCP Test Automation settings.

F3

05/04/22   FRM   USB
 16 : 50   SEQ

OCP Function   Chan: 1

Range:	High	Step_T:	0.05
Start C:	0.000	Delay:	0.000
End C:	71.400	Trig_V:	0.0000
Step_C:	0.002	Keep_T:	0.000
Last_C:	0.000		

| OCP On | Active Channel | | | |
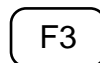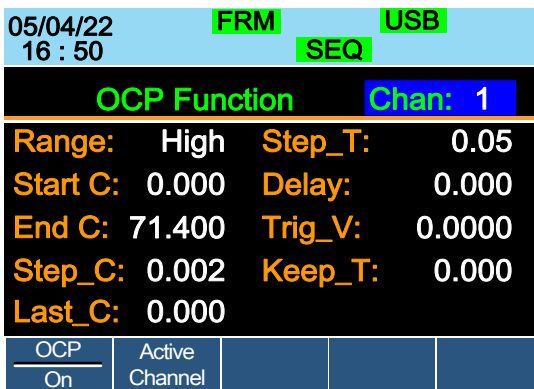
Select Active Channel

7. To select the load channels for the test, press Active Channel (F2).

F2

05/04/22   USB
 16 : 50   OCP

Active Channels for OCP Mode
        CH   Active
        01   →   OFF

| | | | | Previous Menu |

05/04/22   USB
 16 : 50   OCP

Active Channels for OCP Mode
        CH   Active
        01   →   ON
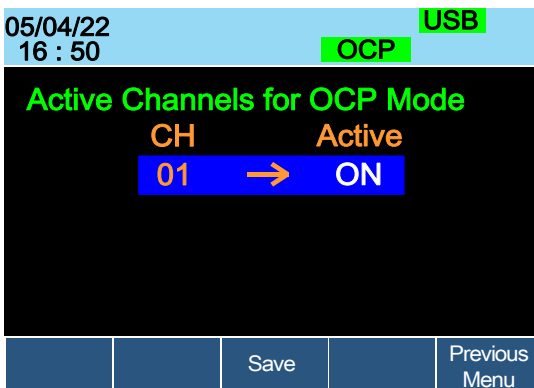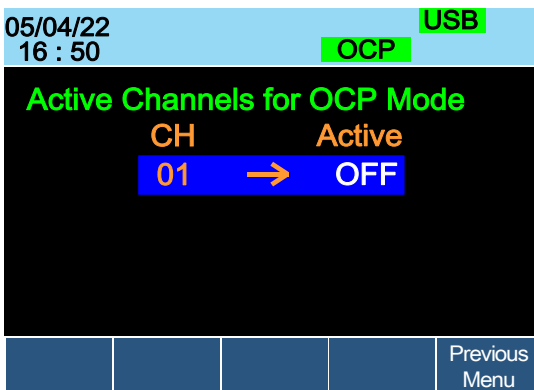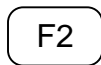
| | | Save | | Previous Menu |

8. Use the selector knob to Enter key to turn the Active value to ON.

```
⟵  or  (ENTER)
```

Save the OCP Test Automation Channel

9. Press Save (F3) to save the OCP test automation channel.

```
F3
```

10. Press Previous Menu (F5) to return to the OCP Test Automation menu.

```
F5
```

11. Press OCP (F1) to turn OCP to ON.

```
F1
```

| 05/04/22 | | | USB |
| 16 : 50 | | OCP | |

OCP Function
Chan: 1

Range:	High	Last_C:	0.45
Start C:	0.20	Step_T:	1.00
End C:	1.50	Delay:	0.500
Step_C	0.10	Trig_V:	3.0000

| OCP On | Active Channel | Save | | |
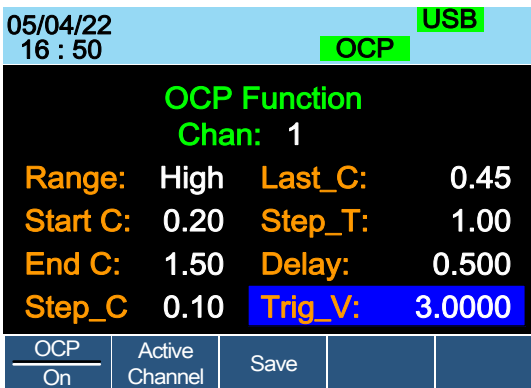
Save the OCP Test Automation Parameters

12. Press Save (F3) to save the OCP test automation parameters.

```
F3
```

Start the OCP Test Automation

13. Press the Load key to start to OCP Test Automation.

```
LOAD  ON/OFF
```

Test Results

Voltage Reading: The voltage of the DUT before the OCP was triggered.

Current Reading: The current of the DUT before the OCP was triggered.

⚠ Note

In addition to the setting the OCP test parameters as described above, the VON voltage settings must also be set according to the output characteristics of the DUT.

An OCP Test Automation example using actual current and voltage waveforms.
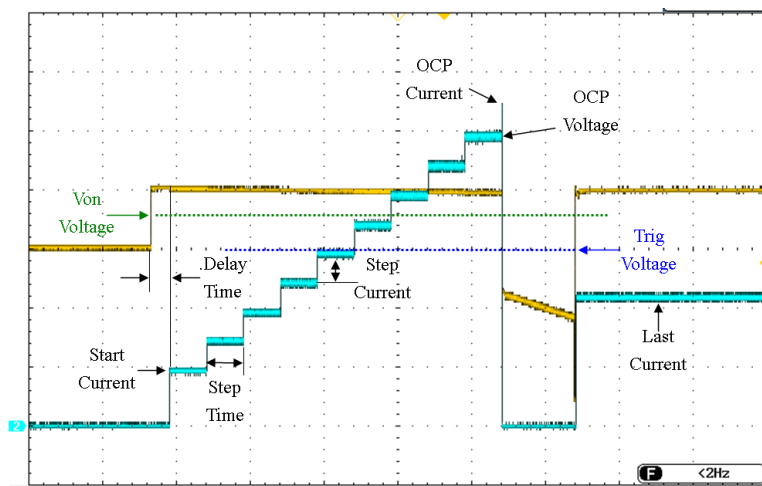
Channel Configuration

The Channel Configuration chapter describes the configuration options for individual channels. Any configuration settings that are changed only apply to the current channel, other channels will not be changed.

Accessing the Configuration Menu

Background   The configuration menu is used to access instrument settings and properties as well as set the protection levels for each channel.

Panel operation   1. Select the channel to be configured by pressing the CHAN key and using the Selector knob.

LOCAL

CHAN →

2. Press the F5 (Configure) key to enter the configuration (Protection) menu.

F5

05/04/22
16 : 50   USB
                                         LOAD

OCP Level	71.400 A
OCP Setting	OFF
OVP Level	81.6 V
OVP Setting	OFF
OPP Level	357.00 W
OPP Setting	OFF

CH1
CCDH

conf

| Protection | Other | Go-NoGo | Group | Previous Menu |
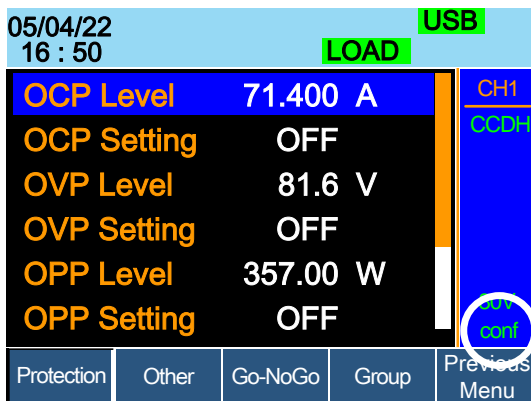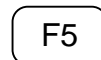
Setting (OCP/OVP/OPP/UVP)

Background	Over Protection is used to set the voltage, current or power limit. In the event that the current, voltage or power exceeds the over protection settings, the load module display will show an error message and beep an alarm.	
	When tripped, Under Voltage Protection (UVP) will turn off the load. UVP trips when the load voltage drops below a set limit.	
	Only when the protection settings are set to On (XXP Setting -On) will the protection modes be active.	
	All protection settings can be set to 2% higher than specification rating.	

Parameters	OCP Level	1.25% Rating A ~ 102% Rating A
	OCP Setting	ON/OFF/Clear
	OVP Level	1.25% Rating V ~ 102% Rating V (0.5% Rating V ~ 102% Rating V for PEL-2041A(B))
	OVP Setting	ON/OFF/Clear
	OPP Level	PEL-2020A(B): 1W ~ 102W PEL-2030A(B)(L): 0.9W ~ 30.6W PEL-2030A(B)(R): 1.25W ~ 255W PEL-2040A(B): 1.75W ~ 357W PEL-2041A(B): 1.75W ~ 357W
	OPP Setting	ON/OFF/Clear
	UVP Level	OFF ~ current using operating voltage range of slave module.
	UVP Setting	Clear
	Protection Clear	All

Panel operation   Ensure the menu is the configuration menu. See
                    page 173.

Protection	Other	Go-NoGo	Group	Previous Menu

```
05/04/22                              USB
 16 : 50                      LOAD

 OCP Level        71.400  A      CH1
                                 CCDH
 OCP Setting        OFF

 OVP Level         81.6  V

 OVP Setting        OFF

 OPP Level       357.00  W

 OPP Setting        OFF           80V
                                  conf
```

Protection	Other	Go-NoGo	Group	Previous Menu
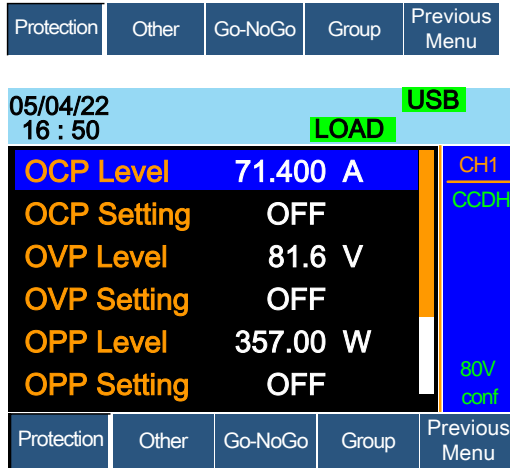
1. Use the Selector knob to highlight
    OCP Level.

2. Press the Selector knob to edit the
    selected level, then turn to
    increase or decrease the value.

                    OR

    P7 7   P8 8   P9 9
    P4 4   P5 5   P6 6
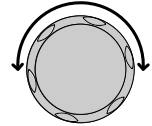
3. Use the number pad to enter a
    number.
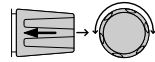
    P1 1   P2 2   P3 3
    P0 0   CAL • LOCK CLEAR
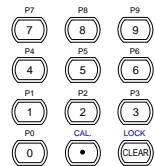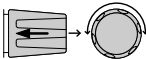
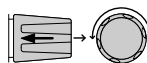| OCP Level	71.400	A

4. Press the Selector knob or Enter   or ENTER
    to confirm selection.
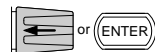
5. Use the Selector knob to highlight
    OCP Setting.
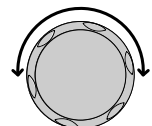
6. Use the selector knob to turn ON, OFF or CLEAR the OCP Setting.

7. Repeat steps 1-5 for :

OCP Level	OPP Setting
OVP Level	UVP Level
OVP Setting	UVP Setting
OPP Level	

Clearing an Alarm When any of the protection settings are tripped, Alarm will be shown on the Mainframe Status Panel and an alarm tone will sound by default.

05/04/22
16 : 50   Alarm

On the local load module, the protection setting that has been tripped will be displayed.

OCP	O C P
OVP	O U P
REV*	r E U _ U
OPP	O P P
OTP*	O t P
CPP*	C P P
UVP	U U P

8. Turn the load off by pressing the Load key and turn off the load input.

LOAD ON/OFF

9. Change the XXP Setting to Clear to clear the alarm.

OCP Setting   Clear

⚠️ Note	*REV, OTP and CPP cannot be cleared using this method, the Protection Clear function must be used instead, see page 177.

See pages 59 and 264 to output alarms via the Go/NoGo output terminal.

The configuration settings only apply to the current channel.

Protection Clear

Background   When any of the protection circuits have been tripped, the Protection Clear function can be used to reset the alarms.

Alarm will be shown on the Mainframe Status Panel and an alarm tone will sound by default when any of the protection settings are tripped.

```
05/04/22
 16 : 50                                    Alarm
```

On the local load module, the protection setting that has been tripped will be displayed.

Example: Reverse voltage protection

```
  r E U _ U
 2 A  CC
      Static
```
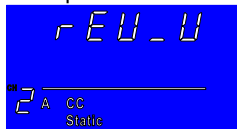
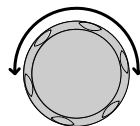|	
OCP	0 C P
OVP	0 U P
REV	r E U _ U
OPP	0 P P
OTP	0 t P
CPP	C P P

UVP   *U*   *U*   *P*

Panel operation   Ensure the menu is in the configuration menu. See page 173.

Protection	Other	Go-NoGo	Group	Previous Menu

1. Turn the load off by pressing the load key if necessary.

   LOAD ON/OFF

2. Use the selector knob to scroll down to Protection Clear.

Protection Clear   All
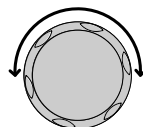
3. Press the Selector knob or Enter to clear all.
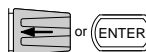
    or (ENTER)

⚠️ Note   The configuration settings only apply to the current channel, other channels will not be affected.

Setting the CC Voltage Range

Background	The Constant Current Voltage range can be set to high or low.
Parameter	CC Vrange High/Low
Panel operation	Ensure the menu is in the configuration menu. See page 173.

Protection	Other	Go-NoGo	Group	Previous Menu

1. Press the F2 (Other) key to enter the other menu.

   F2

G⌶INSTEK

05/04/22		USB
16 : 50		LOAD
CC Vrange	High	CH1
Von Voltage	0.00 V	CCDH
Von Latch	OFF	
CH CONT	Panel	
Independent	OFF	
Load D-Time	0.0 S	80V conf

| Protection | Other | Go-NoGo | Group | Previous Menu |
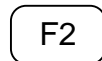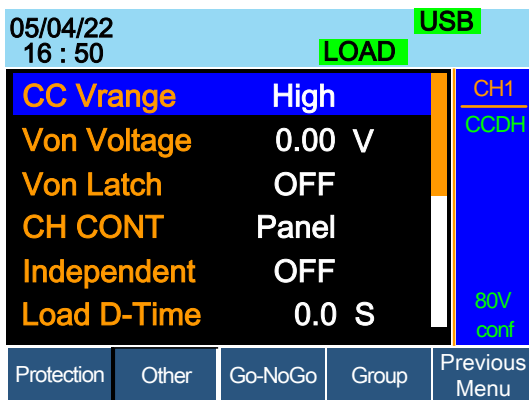
2. Use the Selector knob to highlight CC Vrange.
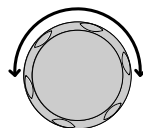
3. Press the Selector knob to edit CC Vrange, then turn to increase or decrease the range.
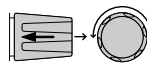
| CC Vrange | | High | |

4. Press the Selector knob or Enter to confirm selection.
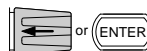
⚠Note   The configuration settings only apply to the current channel.

Adjusting the Von Voltage and Latch

Background   The Von Voltage is the voltage point at which the load module will start to sink current. When Von latch is set to ON, the load will continue to sink current after being tripped, even if the voltage drops below the Von Voltage level. The step resolution of Von Voltage is load module dependent.

Parameters	Von Voltage	0.0~Rating volts
	Von Latch	ON/OFF

Panel operation   Ensure the menu is in the configuration menu. See page 173.

Protection	Other	Go-NoGo	Group	Previous Menu

1. Press the F2 (Other) key to enter the other menu.

F2

05/04/22 16 : 50 USB LOAD

CC Vrange	High	CH1
Von Voltage	0.00 V	CCDH
Von Latch	OFF	
CH CONT	Panel	
Independent	OFF	
Load D-Time	0.0 S	80V conf

Protection	Other	Go-NoGo	Group	Previous Menu
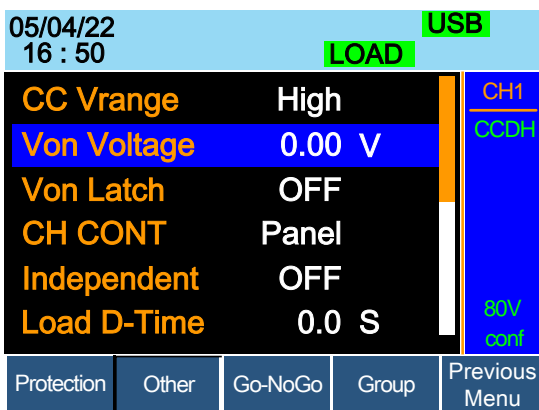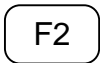
2. Use the Selector knob to highlight Von Voltage.
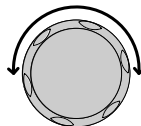
3. Press the Selector knob to edit the selected value, then turn to increase or decrease the value.

OR

Use the number pad to enter a number.

P7 7   P8 8   P9 9
P4 4   P5 5   P6 6
P1 1   P2 2   P3 3
P0 0   CAL. •   LOCK CLEAR

Von Voltage   0.00 V
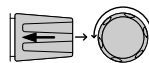
4. Press the Selector knob or Enter to confirm selection.
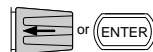
5. Repeat steps 3 to 5 to turn Von Latch ON or OFF

For details about Von and Latch settings please see page 84.

Note | The configuration settings only apply to the current channel, other channels will not be affected.
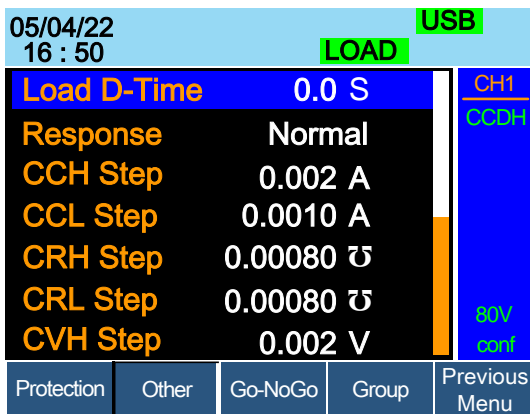
Configuring the Short settings

Background | The Short Key option is used to simulate a short circuit.

The Short Function option is used to set whether short function is enabled or disabled.

The Short key option can be configured to toggle (press SHORT on the load module to toggle ON or OFF) or to Hold (the SHORT key is held to short the load.

The Short Safety option can be used to set whether short function enabled depends on Load ON or not. When setting to ON, short function enabled only when Load ON mode is enabled. When setting to OFF, short function directly enabled independent of Load ON mode.

Parameter | Short Function   ON/OFF

Short Key   Hold/Toggle

Short Safety   ON/OFF

Panel operation | Ensure the menu is in the configuration menu. See page 173.

| Protection | Other | Go-NoGo | Group | Previous Menu |

1. Press the F2 (Other) key to enter the other menu.

   F2

05/04/22　　　　　　　　　　　USB
　16 : 50　　　　　　　　LOAD

CVL Step	0.0004 V	CH1
CPH Step	0.01 W	CVH
CPL Step	0.001 W	
Short Function	ON	
Short Key	Toggle	Slow
Short Safety	ON	80V conf

| Protection | Other | Go-NoGo | Group | Previous Menu |

2. Use the Selector knob to highlight Short Function.
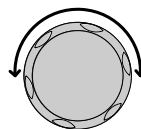
3. Press the Selector knob to edit the selected setting, turn to change the setting.
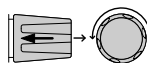
   Short Function　　**ON**

4. Press the Selector knob or Enter to confirm selection.
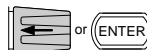
   or ENTER

5. Use the Selector knob to highlight Short Key.
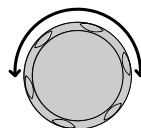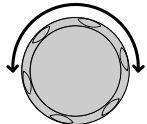
6. Press the Selector knob to edit the selected setting, turn to change the setting.

   Short Key　　**Toggle**

7. Press the Selector knob or Enter to confirm selection.

8. Use the Selector knob to highlight Short Safety.

9. Press the Selector knob to edit the selected setting, turn to change the setting.

<div style="text-align:center">**Short Safety**   **ON**</div>

10. Press the Selector knob or Enter to confirm selection.

Configuring Channel Control

Background
When Channel Control (CH CONT) is set to External, it will disable editing the active channel load. Instrument buttons and knobs can still be used to access the menu for the active channel or to edit other channels that do not have channel control active. This prevents settings on the active channel from being changed on the local machine. See pages 56 & 87 for details.

Parameter
CH CONT   Panel/External

Panel operation
Ensure the menu is in the configuration menu. See page 173.

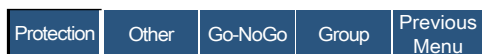| Protection	Other	Go-NoGo	Group	Previous Menu

1. Press the F2 (Other) key to enter the other menu.

F2

05/04/22　　　　　　　　　USB
　16 : 50　　　　　　　LOAD

		CH1
CC Vrange	High	CCDH
Von Voltage	0.00 V	
Von Latch	OFF	
CH CONT	Panel	
Independent	OFF	80V
Load D-Time	0.0 S	conf

Protection	Other	Go-NoGo	Group	Previous Menu
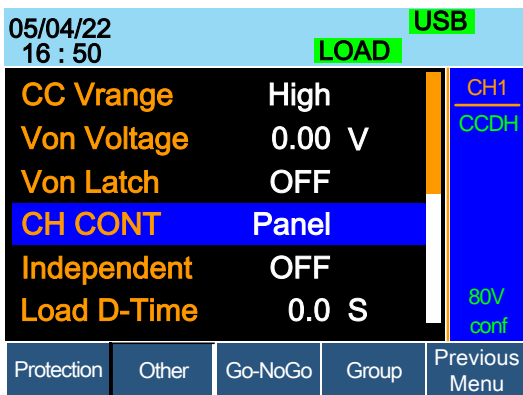
2. Use the Selector knob to highlight CH CONT.

3. Press the Selector knob to edit the selected setting, turn to change the setting from Panel to External.

CH CONT　　External
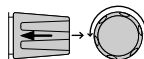
4. Press the Selector knob or Enter to confirm selection.
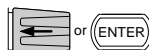
Channel control is now activated. To turn Channel Control off, CH CONT must be set to Panel again. When Channel Control is active, EXT will be displayed on the side panel for the active channel.

CH1

CCDH

EXT
80V
conf

⚠Note　　Channel Control can only be activated on the active channel; other channels will not be affected.

Configuring the Independent Setting

Background	The Independent setting allows a channel to be load independent from the mainframe. What this means is that a load module with Independent set to ON can only load from the local load module. If the LOAD ON/OFF key is pressed from the mainframe, the channel with Independent set to ON will be unaffected by the mainframe, except when running a program.
Parameter	Independent ON/ OFF
Panel operation	Ensure the menu is in the configuration menu. See page 173.

Protection	Other	Go-NoGo	Group	Previous Menu

1. Press the F2 (Other) key to enter the other menu.

F2

```
05/04/22                          USB
  16 : 50                        LOAD
CC Vrange        High                    CH1
Von Voltage      0.00  V                 CCDH
Von Latch        OFF
CH CONT          Panel
Independent      OFF
Load D-Time      0.0  S                  80V
                                         conf
```

Protection	Other	Go-NoGo	Group	Previous Menu
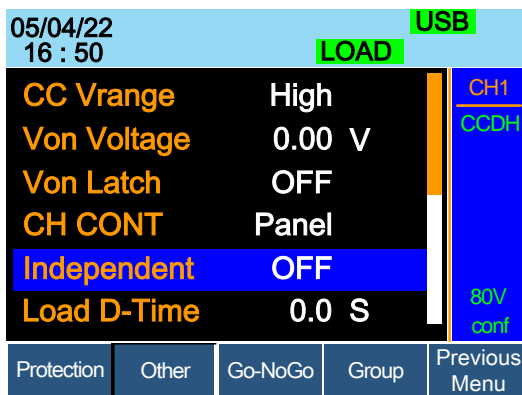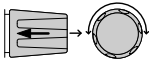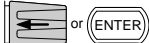
2. Use the Selector knob to highlight Independent.
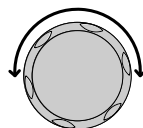
3. Press the Selector knob to edit the selected setting, turn to change the setting.

Independent　　**OFF**

4. Press the Selector knob or Enter to confirm selection.

⚠Note

When a channel has been set to independent, an asterisk (*) will be shown next to the channel number indicator in the Current Operation Channel Status panel.

The configuration settings only apply to the current channel, other channels will not be affected.

*CH1
CC DH

80V
conf
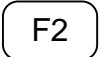
Configuring the Load Delay Time

Background	The mainframe can delay loading a channel by up to 10 seconds. However the Delay Time is only applicable for manual loading. Delay Time is not applicable to Programs or Sequences.
Parameter	Load D-Time 0~10 S
Panel operation	Ensure the menu is the configuration menu. See page 173.

Protection	Other	Go-NoGo	Group	Previous Menu

1. Press the F2 (Other) key to enter the other menu.

F2

05/04/22		USB
16 : 50	LOAD	
Load D-Time	**0.0 S**	CH1
Response	**Normal**	CCDH
CCH Step	**0.002 A**	
CCL Step	**0.0010 A**	
CRH Step	**0.00080 ℧**	
CRL Step	**0.00080 ℧**	
CVH Step	**0.002 V**	80V
		conf

Protection	Other	Go-NoGo	Group	Previous Menu
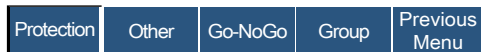
2. Use the Selector knob to highlight Load D-Time.
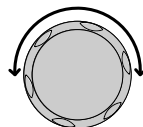
3. Press the Selector knob to edit the selected setting, turn to change the setting.
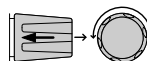
               OR

   Use the number pad to enter a number.

   Load D-Time   0.0 S

4. Press the Selector knob or Enter to confirm selection.
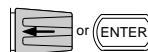
Note   The Delay Time only applies to the current channel; other channels will not be affected.

              Delay time only applies when the load is manually turned on or during start up with the Auto Load On setting (page 201).

Configuring Step Resolution

Background   The CC, CR, CV and CP step resolution settings can be edited in the configuration menu. These step resolution settings directly correspond to the step resolution of the coarse adjustment when setting the CC, CR, CV and CP parameters.

                 The minimum and maximum step resolution that can be set for each channel is dependent on the load module. For more information on step resolution see page 84.

Step Resolution		Minimum[*1]	Maximum[*2]	Unit
PEL-2020A(B)	CCH Step	HR/20000	HR/2	Amperes A
	CCL Step	LR/20000	LR/2	Amperes A
	CRH Step	HR/40000	HR/2	Siemens ℧
	CRL Step	LR/40000	LR/2	Siemens ℧
	CVH Step	HR/40000	HR/2	Voltage V
	CVL Step	LR/40000	LR/2	Voltage V
	CPH Step	HR/10000	HR/2	Watt W
	CPL Step	LR/10000	LR/2	Watt W
PEL-2030A(B)(L)	CCH Step	HR/40000	HR/2	Amperes A
	CRH Step	HR/40000	HR/2	Siemens ℧
	CRL Step	LR/40000	LR/2	Siemens ℧
	CVH Step	HR/40000	HR/2	Voltage V
	CVL Step	LR/40000	LR/2	Voltage V
	CPH Step	HR/30000	HR/2	Watt W

PEL-2030A(B)(R)	CCH Step	HR/40000	HR/2	Amperes A
	CCL Step	LR/40000	LR/2	Amperes A
	CRH Step	HR/40000	HR/2	Siemens ℧
	CRL Step	LR/40000	LR/2	Siemens ℧
	CVH Step	HR/40000	HR/2	Voltage V
	CVL Step	LR/40000	LR/2	Voltage V
	CPH Step	HR/25000	HR/2	Watt W
	CPL Step	LR/25000	LR/2	Watt W
PEL-2040A(B)	CCH Step	HR/35000	HR/2	Amperes A
	CCL Step	LR/35000	LR/2	Amperes A
	CRH Step	HR/40000	HR/2	Siemens ℧
	CRL Step	LR/40000	LR/2	Siemens ℧
	CVH Step	HR/40000	HR/2	Voltage V
	CVL Step	LR/40000	LR/2	Voltage V
	CPH Step	HR/35000	HR/2	Watt W
	CPL Step	LR/35000	LR/2	Watt W
PEL-2041A(B)	CCH Step	HR/20000	HR/2	Amperes A
	CCL Step	LR/20000	LR/2	Amperes A
	CRH Step	HR/40000	HR/2	Siemens ℧
	CRL Step	LR/40000	LR/2	Siemens ℧
	CVH Step	HR/50000	HR/2	Voltage V
	CVL Step	LR/50000	LR/2	Voltage V
	CPH Step	HR/35000	HR/2	Watt W
	CPL Step	LR/35000	LR/2	Watt W

[1] HR = High range rated value, LR = Low range rated value.
[2] Maximum value = HR (LR)/2 * 1.02.

Note | Use the Shift key to toggle between coarse and fine adjustment mode when editing the CC, CR, CV and CP values with the Selector knob on the main display. The fine adjustment resolution varies between the function and load module used.

Coarse mode: Fine mode:
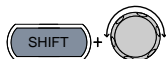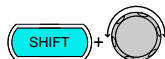
SHIFT +   SHIFT +

Panel operation | Ensure the menu is the configuration menu. See page 173.

| Protection | Other | Go-NoGo | Group | Previous Menu |

1. Press the F2 (Other) key to enter the other menu.

F2

05/04/22
16 : 50   USB
                                 LOAD

| Response | Normal | CH1
| CCH Step | 0.002 A | CCDH
CCL Step	0.0010 A
CRH Step	0.00080 ℧
CRL Step	0.00080 ℧
CVH Step	0.2 V	80V
                         conf

| Protection | Other | Go-NoGo | Group | Previous Menu |
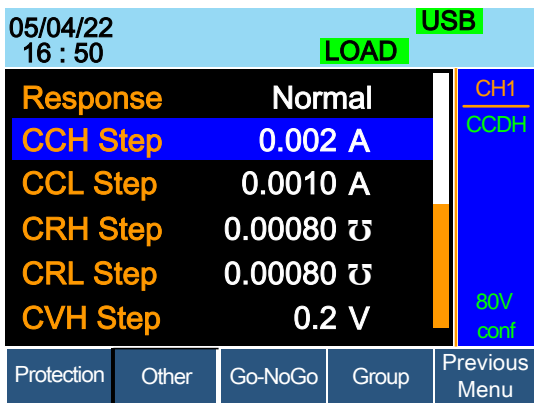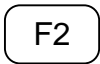
2. Use the Selector knob to scroll down to highlight CCH Step.
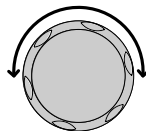
Note | CCH Step is off-screen when entering Other menu.

3. Press the Selector knob to edit the selected setting, turn to change the setting.

OR
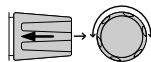
Use the number pad to enter a number.

CCP Step	0.002 A

4. Press the Selector knob or Enter to confirm selection.
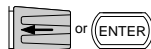
5. Repeat steps 2-4 to edit the step resolution of:

CCL Step	CVH Step	CPH Step
CRH Step	CVL Step	CPL Step
CRL Step		

⚠ Note   The Step resolution settings only apply to the active channel, other channels will not be affected.

Configuring Response Time

Background	The Response time setting is used to limit current draw when input voltage less than 1V. The Response setting sets the bandwidth of the load to Fast (20kHz) or as Normal (200Hz).
Parameters	Response Normal, Fast
Panel operation	Ensure the menu is the configuration menu. See page 173.

Protection	Other	Go-NoGo	Group	Previous Menu

1. Press the F2 (Other) key to enter the other menu.

F2

05/04/22 16 : 50		USB LOAD

Response	Normal	CH1 CCDH
CCH Step	0.002 A	
CCL Step	0.0010 A	
CRH Step	0.00080 ℧	
CRL Step	0.00080 ℧	
CVH Step	0.002 V	80V conf

Protection	Other	Go-NoGo	Group	Previous Menu
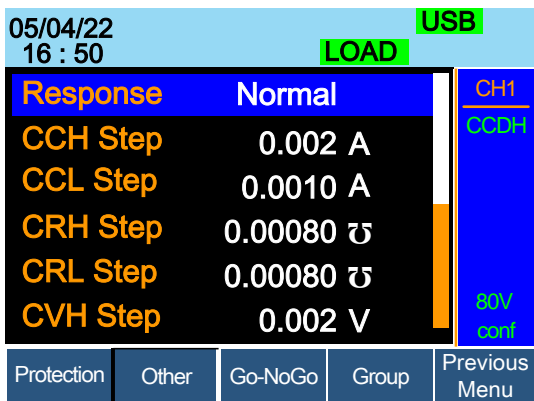
2. Use the Selector knob to scroll down to highlight Response.
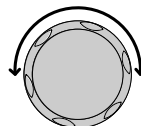
⚠️ Note   Response is off-screen when entering Other menu.

Response   **Normal**

3. Press the Selector knob or Enter to confirm selection.
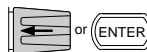
⚠️ Note   The Response settings only apply to the active channel, other channels will not be affected.

Go/NoGo

Background   Go/NoGo mode is used to set threshold limits. When a load is within the limit(s) it is considered to be "Go", when the load has exceeded the limit it is considered to be "NoGo".

Go/NoGo limits can be set as either absolute values (Entry Mode set to "Value") or as a percentage offset from a nominal (Center) value (Entry Mode set to "Percent").

Go/NoGo can be used in both high and low ranges, as well as CC, CV, CR and CP Modes. The Go/NoGo status can be read using the rear Go/NoGo output.

A delay time can also be imposed for up to 1 second.

⚠ Note | Any Go/NoGo configuration only applies to the current channel with the same mode and range.

Parameters	Entry Mode	Value	Percent
	CC Mode	High: V	High: %
	CR Mode	Low: V	Low: %
			Center: V
	CV Mode	High: A	High: %
	CP Mode	Low: A	Low: %
			Center: A
	Delay Time	0.0~1.0 seconds	
	SPEC Test	ON/OFF	

Panel Operation   Ensure the menu is in the Configuration menu. See page173.

Protection	Other	Go-NoGo	Group	Previous Menu

Choose Absolute/ 1. Press (F3) Go-NoGo to access the   Percentage limits   Go/NoGo menu.

F3

2. Use the selector knob to edit Entry Mode.
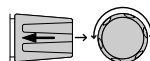
3. Choose Value for absolute limits or Percent for percentage offset limits.

Entry Mode   Value

Or

Entry Mode   Percent

4. The menu changes according to the selection.

   Value   Percent
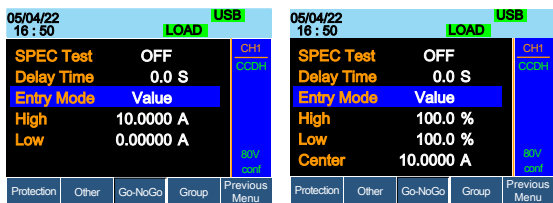
5. Use the Selector knob and number pad to edit Delay time, High, Low and Center (Percent mode only).
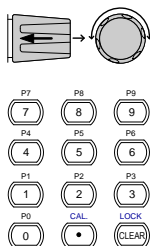
6. Press the selector knob or Enter to confirm each value.
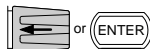
Turn Go/NoGo On/Off

7. Use the Selector knob to edit Spec Test.
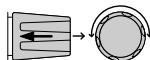
8. Choose ON to turn on Go/NoGo.

   SPEC Test   ON

9. Choose OFF to turn off Go/NoGo.

   SPEC Test   OFF

When SPEC test is set to ON, SPEC will be displayed in the Current Operation Channel Status panel.

CH1
CCDH

SPEC

80V
conf

Group Unit

Background   The Group Unit menu allows load modules of the same type and rating to be configured as a single unit when used in parallel. Up to 4 load modules can be used in this mode.

Operating the PEL-2000A series load modules in Group Unit mode is almost identical to using the load modules separately. The only difference is that the channel configuration only needs to be setup for channel 1 and not individually for each channel.

There are two mode types: Para and Sync. The Para setting allows the all the parallelized load modules to be operated as a single large load module. Sync mode allows the settings of a single unit to be synchronized across all the other parallelized load modules.

The Display Mode will determine which parameters are displayed on the local load modules.

⚠ Note	Only CC or CR mode can be used in Group Unit.
	For the single channel load modules, PEL-2040A(B) and PEL-2041A(B) are fully support these two modes (Para, Sync) of group function.
	The PEL-2030A(B) does not support group function.
	The dual channel of PEL-2020A(B) does support group function partially. It can support to group 2 units of same module under the Sync mode only. That means the PEL-2020A(B) can be 2chx100W or 1chx200W.
	Ensure the same firmware used for both units.

Parameters	Total Unit	2/3/4/OFF
	Group Mode	Para/Sync
	Display Mode	V,I / V,W/I,W/S

⚠ Note	If "Total Unit: 2" is set on a 4-channel mainframe, the modules of channels 3 and 4 won't be set to the group unit function.

Panel Operation
1. Ensure current channel is selected as the active channel.

2. Ensure the menu is in the Configuration menu.

Protection	Other	Go-NoGo	Group	Previous Menu
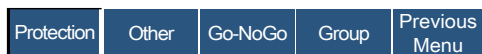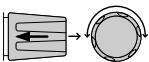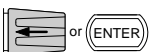
Parallel Setup
3. Press (F4) Group to access the Group menu.

F4

```
05/04/22                          USB
 16 : 50                    LOAD
Total Unit              OFF      CH1
Group Mode              Para     CCDH
Display Mode             V,I


                                 80V
                                 conf
Protection  Other  Go-NoGo  Group  Previous
                                    Menu
```
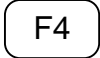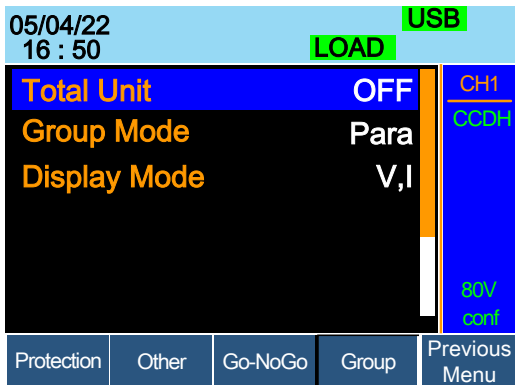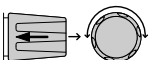
4. Use the Selector knob to change Total Unit from the OFF setting to the number of parallel units.

Total Unit   2
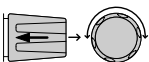
5. Press the selector knob or Enter to confirm.

Parallel Mode 6. To change the type of mode, use the Selector knob to edit Group Mode.

7. Choose Para to operate the units as a single large load module, or choose Sync to synchronize the load settings across each parallel unit.

Group Mode   Para

Display Mode 8. Use the selector knob to change the display settings on the local load modules.

9. Choose from V, I / V, W / I,W or S.

Display Mode   V,I

When Para Unit is active, an indicator will be displayed on the screen. The indicator depends on the Group Mode. P will be displayed for Para Mode and S will be displayed for Sync Mode.

CHXP   Para Mode

CHXS   Sync Mode

The PEL-2000A is now ready to operate in Parallel Mode.

Turn Parallel Mode Off	10. To disable Parallel Mode, use the selector knob to change Total Unit to OFF.
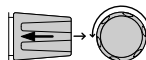
Total Unit   OFF

Mainframe Configuration

The Mainframe Configuration chapter describes configuration settings that apply to all channels and general interface settings.

Accessing System Information

Background	The System Information displays the mainframe and load module(s) serial numbers.
Parameters	MainFrame Ver: Mainframe firmware version.
	PEL-200X SN: Mainframe Serial number.
	SlotX(Y)Ver: The version number of the Xth load module occupying the Xth slot with channel number Y.
	PEL-20XX SN: The serial number and module model of the Xth load module
	Y designates the channel of each installed load module. For example if dual channel load modules are installed, then Ch (1,2) will be used for the firmware and serial number.
Panel operation	1. Press the Shift Key then the Help key to access the Utility menu/System Info menu.

05/04/22   USB
  16 : 50   LOAD
MainFrame Ver: 3.XX XXXX
    PEL-2002 SN: EJXXXXXX
Slot1(1)Ver: 3.XX
    PEL-2041 SN: EJXXXXXX
Slot2(2)Ver: 3.XX
    PEL-2041 SN: EJXXXXXX

| System Info | Load | Interface | Time Set | Other |

Note
If you have set Memo through command, you can see the Memo information by pressing System Info (F1) once again. (Please refer to the chapter contains commands ":MEMo" and ":CHANnel:MEMo" in the programming manual for details)

05/04/22   USB
  16 : 50   LOAD
MainFrame (PEL-2004B) MEMO:
No Memo
CH1 (PEL-2040B) MEMO:
123
CH2 (PEL-2040B) MEMO:
123

| System Memo | Load | Interface | Time Set | Other |

Accessing the Load Menu

Background	The PEL-2000A series is able to automatically start loading from the last program or load setting.
	If Auto Load On is set to Load, the last load setup used before the machine was reset will automatically start to load upon startup.
	If Program is set as the Auto Load On configuration, the last program executed will start upon the next start up.
Parameters	Auto Load ON/OFF
	Auto Load On Load/Program
Panel operation	1. Press the Shift Key then the Help key to access the Utility menu.

UTILITY
SHIFT + HELP

2. Press F2 (Load).

F2

```
05/04/22                        USB
  16 : 50              LOAD
              Load Setting
Auto Load                      OFF
Auto Load On                   Load



   System    Load    Interface  Time Set   Other
    Info
```
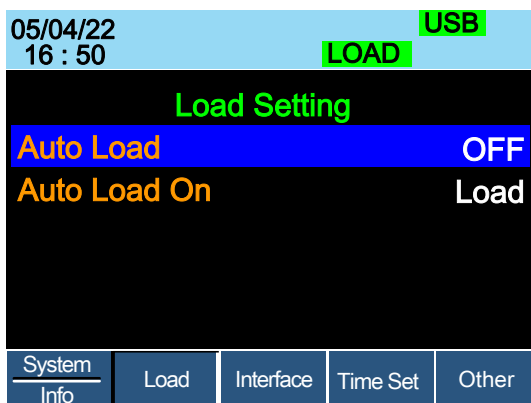
3. Press the Selector knob, then turn to choose Auto Load.
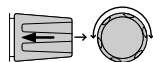
4. Press the Selector knob or Enter to confirm selection.

or (ENTER)
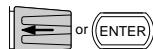
5. Scroll to Auto Load On and choose Load or Program for the next time the PEL-2002A starts up.

Adjusting the Speaker

Background	The PEL-2000A series has an internal speaker for both the mainframe and load modules. The speaker function turns On/Off the sound for the UI (key presses and scrolling). The speaker setting will not alter the sound for protection alarms or Go/NoGo alarms.
Parameter	Speaker ON/OFF
Panel operation	1. Press the Shift Key then the Help key to access the Utility menu.
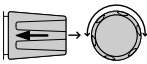
SHIFT + HELP (UTILITY)

2. Press F5 (Other Menu).

F5

05/04/22   USB
 16 : 50   LOAD
Other Setting

Speaker	ON
Contrast	8
Brightness	64
Frame CONT	OFF
Alarm Tone(M)	OFF

System Info	Load	Interface	Time Set	Other
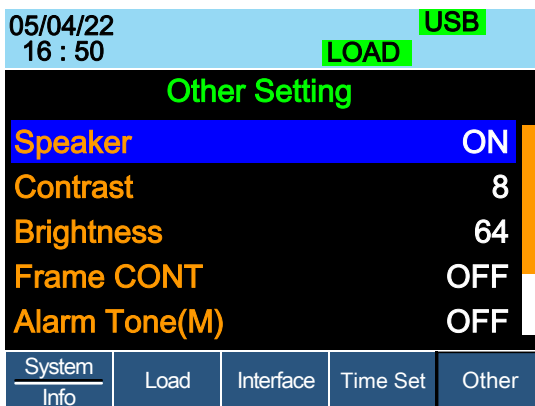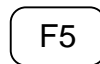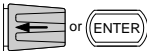
3. Use the Selector knob to highlight Speaker.
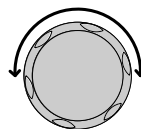
4. Press the Selector knob to edit Speaker, then turn to change from On to Off and vice versa.
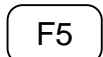
<div style="background:blue; color:orange;">Speaker</div> **ON**

5. Press the Selector knob or Enter to confirm selection.

Adjusting the Display Settings
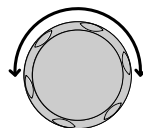
Background   The PEL-2000A series has a TFT LCD display. The display brightness and contrast can be controlled via the utility menu.

Parameters	Brightness	50~90	50(low)	90(bright)
	Contrast	3~13	3(low)	13(high)
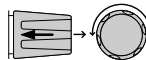
Panel operation

1. Press the Shift Key then the Help key to access the Utility menu.

2. Press F5 (Other Menu).

F5

05/04/22
16 : 50   USB   LOAD

Other Setting

Speaker	ON
Contrast	8
Brightness	64
Frame CONT	OFF
Alarm Tone(M)	OFF

System Info	Load	Interface	Time Set	Other
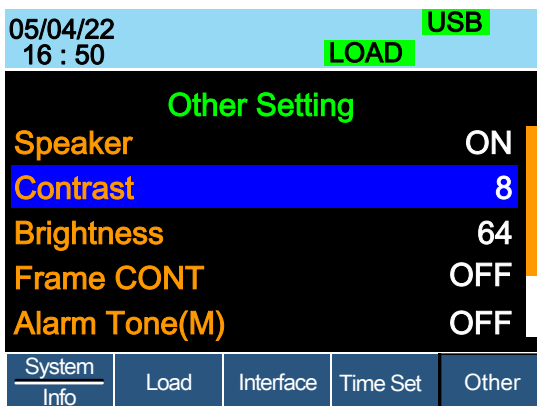
3. Use the Selector knob to highlight Contrast.

4. Press the Selector knob to edit contrast, then turn to increase or decrease the value.

<div style="background:blue;color:orange">Contrast</div>   8

5. Press the Selector knob or Enter to confirm selection.
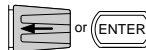
6. Repeat steps 3-5 for the Brightness.

Adjusting the Frame Control

Background	Frame control is used to control a number of different frame linked mainframes (slaves) with a master mainframe. For information on frame control, frame control interface and connection see pages 54 & 261.
⚠Note	When using frame control, ensure the same firmware is installed in both master and slave units.
Parameters	Frame CONT ON/OFF
Panel operation	1. Connect the mainframes using a frame link connection. Page 54.
	2. On the master mainframe, press the Shift Key then the Help key to access the Utility menu.
	3. Press F5 (Other Menu). F5

GWINSTEK

```
05/04/22                        USB
 16 : 50                 LOAD
           Other Setting
 Speaker                    OFF
 Contrast                      8
 Brightness                   64
 Frame CONT                 OFF
 Alarm Tone(M)              OFF
 System    Load   Interface  Time Set  Other
  Info
```
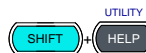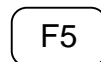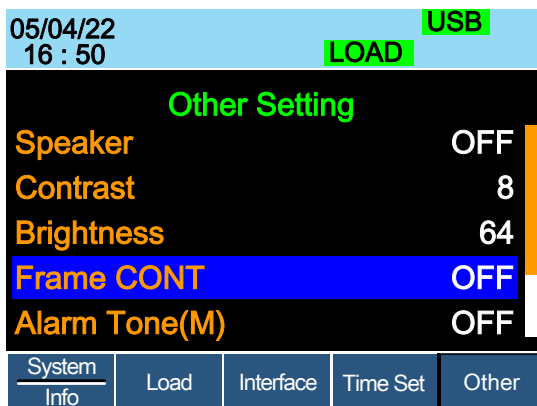
4. Use the Selector knob to highlight Frame CONT.
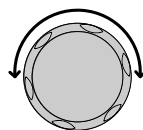
5. Press the Selector knob to edit, then turn to turn Frame CONT (frame control) ON or OFF.

```
05/04/22          FRM        USB
 16 : 50                 LOAD
           Other Setting
 Speaker                    OFF
 Contrast                      8
 Brightness                   64
 Frame CONT                  ON
 Alarm Tone(M)              OFF
 System    Load   Interface  Time set  Other
  Info
```
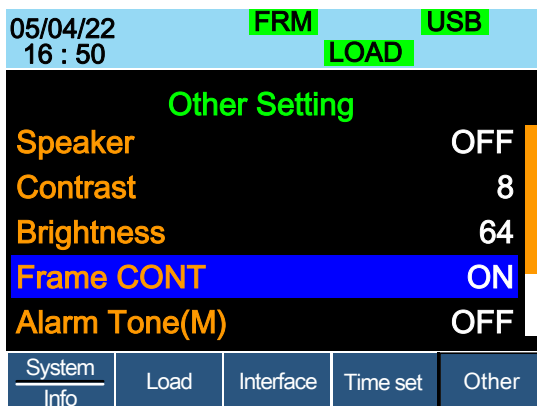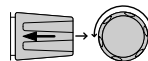
When Frame CONT is set to ON the mainframe will display FRM (Master) or FRS (Slave) on the top of the display.

6. Repeat the above steps for any connected slave mainframe units.

Frame control is now ready for both master and slave mainframes.

Adjusting the Knob Control Type

Background	The mainframe control knob can be set to "Update" or "Old" mode.
	When setting to Update mode, rotating the mainframe knob will change the setting value of load module at the same time.
	When setting to Old mode, rotating the mainframe knob won't change the setting value of load module unless pressing the knob or Enter key.
Parameter	Knob Type Updated/Old
Panel operation	1. Press the Shift Key then the Help key to access the Utility menu.

UTILITY

SHIFT + HELP

2. Press F5 (Other Menu).

F5

05/04/22
16 : 50

USB
LOAD

Other Setting

Brightness	64
Frame CONT	OFF
Alarm Tone(M)	OFF
Alarm Tone(S)	OFF
Knob Type	Updated

System Info	Load	Interface	Time Set	Other

3. Use the Selector knob to move the cursor down to Knob Type (below the initial screen).
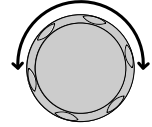
4. Press the Selector knob to highlight Knob Type, then turn to change to Old/Updated.
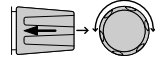
Knob Type   Updated
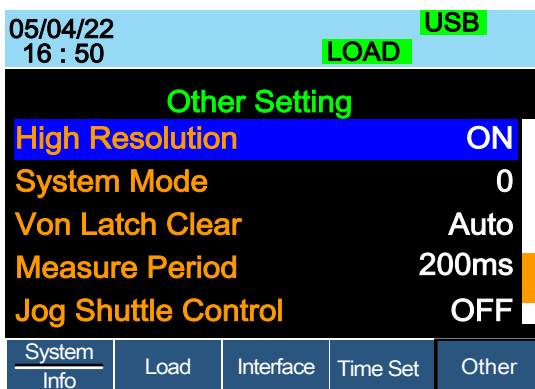
5. Press the Selector Knob or Enter to confirm selection.
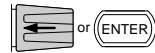
Configuring Alarm Sound

Background	The PEL-2000A series has two different types of alarms, one located on the mainframe (Alarm Tone M) and one for each load module (Alarm Tone S).
	Alarm Tone (M)/(S) can individually be set ON or OFF.
Parameter	Alarm Tone(M) ON/OFF
	Alarm Tone(S) ON/OFF
Panel operation	1. Press the Shift Key then the Help key to access the Utility menu.
	2. Press F5 (Other Menu).

F5

```
05/04/22                              USB
 16 : 50                      LOAD

            Other Setting
Brightness                            64
Frame CONT                           OFF
Alarm Tone(M)                        OFF
Alarm Tone(S)                        OFF
Knob Type                        Updated
```

System Info	Load	Interface	Time Set	Other
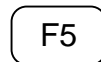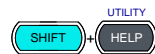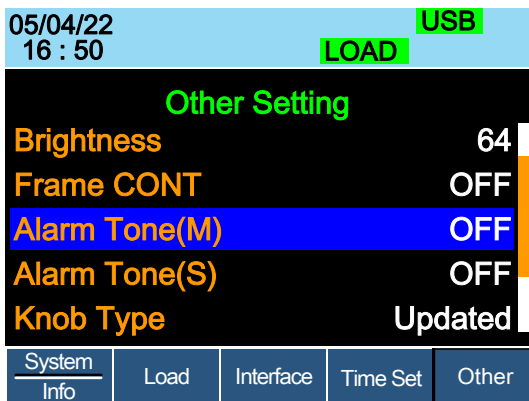
3. Use the selector knob to highlight Alarm Tone(M)
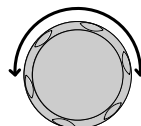
4. Press the Selector knob to select the master alarm (Alarm Tone (M)), turn to edit and press to confirm selection.

```
Alarm Tone(M)          ON
```
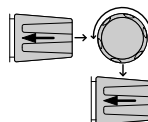
5. Repeat the steps to edit the slave alarm (Alarm Tone(S)).

Configuring Go/NoGo Alarm Sound

Background	When any Go/NoGo limits are tripped from any channel, a tone can be set as an alarm.
	The Go_NoGo tone alarm settings apply to all channels.
Parameter	Go_NoGo Tone ON/OFF
Panel operation	1. Press the Shift Key then the Help key to access the Utility menu.

UTILITY
SHIFT + HELP

2. Press F5 (Other Menu).

F5

| 05/04/22 | USB |
| 16 : 50 | LOAD |

Other Setting

Alarm Tone(S)	OFF
Knob Type	Updated
Go_NoGo Tone	OFF
Slave Knob	SetValue
Language	English

| System Info | Load | Interface | Time Set | Other |
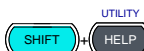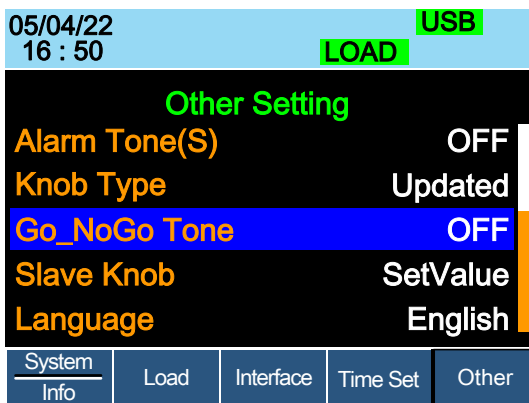
3. Use the Selector knob to move the cursor down to Go_NoGo Tone (below the initial screen).
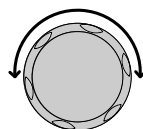
4. Press the Selector knob to highlight Go_NoGo Tone, then turn to change to ON/OFF.

Go_NoGo Tone   OFF
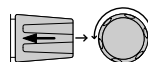
5. Press the Selector Knob or Enter to confirm selection.

or (ENTER)
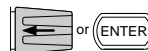
Adjusting Slave Knob Settings
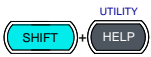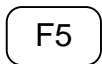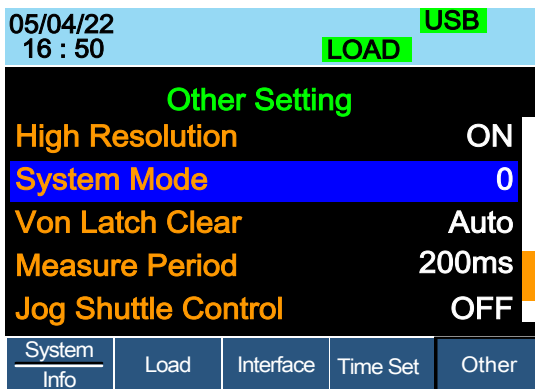
Background   Channel loads can be edited using the local load module or the Mainframe. When using the slave knob to edit a load, the load module display can be set to two different types: SetValue and Measured.

When a load is ON, SetValue will always display
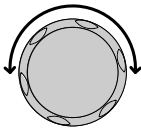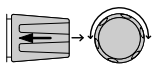
the set value (A Value, B Value) on the local load module display whilst "Measure" will show the actual measured value when editing the load. These settings apply to all channels.

The "Measure" setting can be temporarily disabled by pressing the Slave Knob to display the "SetValue" instead of the "Measure" value in the local load module display.

Parameter	Slave Knob Measure/SetValue

Panel operation	1. Press the Shift Key then the Help key to access the Utility menu.	SHIFT + HELP (UTILITY)

2. Press F5 (Other Menu).

F5

```
05/04/22                    USB
  16 : 50              LOAD

        Other Setting
Alarm Tone(S)              OFF
Knob Type             Updated
Go-NoGo Tone              OFF
Slave Knob           SetValue
Language              English

System   Load   Interface  Time Set  Other
 Info
```
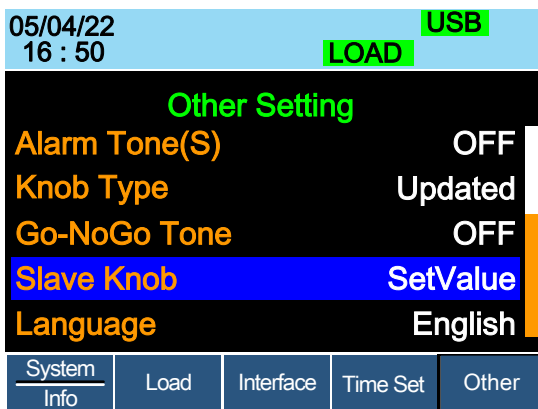
3. Use the Selector knob to move the cursor down to Slave Knob (below the initial screen).

4. Press the Selector Knob to highlight Slave Knob, then turn to change to Measure/SetValue.

Slave Knob   SetValue

5. Press the Selector Knob or Enter to confirm selection.
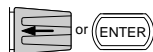
View Language Settings

Background   The language settings can be viewed in the Utilities menu.

Panel operation 1. Press the Shift Key then the Help key to access the Utility menu.

UTILITY
SHIFT + HELP

2. Press F5 (Other Menu).

F5

05/04/22   USB
 16 : 50   LOAD

Other Setting
Alarm Tone(S)   OFF
Knob Type   Updated
Go-NoGo Tone   OFF
Slave Knob   SetValue
Language   English

| System Info | Load | Interface | Time Set | Other |
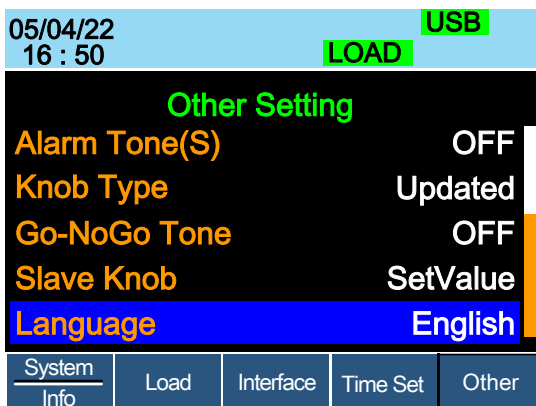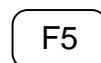
3. Use the Selector knob to move the cursor down to Language (below the initial screen).
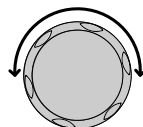
Adjusting the High Resolution

Background	ON: When there is difference between the measured value of voltage, current or power which displayed on the module panel and the setting value, the system will fine tune the load value so that the measured value close to the setting value. The system will perform and complete this action after loading is on in one second.
	OFF: The system won't perform any action when there is difference between the measured value of voltage, current or power which displayed on the module panel and the setting value.
Parameter	High Resolution ON/OFF
Panel operation	1. Press the Shift Key then the Help key to access the Utility menu.
	2. Press F5 (Other Menu).

SHIFT + HELP (UTILITY)

F5

05/04/22
16 : 50
USB
LOAD

Other Setting

High Resolution	ON
System Mode	0
Von Latch Clear	Auto
Measure Period	200ms
Jog Shuttle Control	OFF

System Info	Load	Interface	Time Set	Other

3. Use the Selector knob to highlight High Resolution.
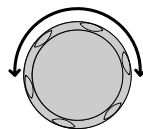
4. Press the Selector knob to edit High Resolution, then turn to change from ON to OFF and vice versa.
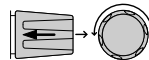
High Resolution   ON

5. Press the Selector knob or Enter to confirm selection.
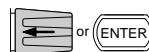
Adjusting the System Mode

Background	1: When any command is received, the Master panel will automatically enter the Remote fast mode.
	0: The Master panel won't automatically enter the Remote fast mode.
⚠Note	For details about remote mode fast/normal, please refer to command :UTILity:REMote:MODE in the programming manual.
Parameters	System Mode 0/1
Panel operation	1. Press the Shift Key then the Help key to access the Utility menu.
	2. Press F5 (Other Menu).

| 05/04/22 | | | USB |
| 16 : 50 | | LOAD | |

Other Setting

High Resolution	ON
System Mode	0
Von Latch Clear	Auto
Measure Period	200ms
Jog Shuttle Control	OFF

| System Info | Load | Interface | Time Set | Other |

3. Use the Selector knob to highlight System Mode.
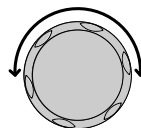
4. Press the Selector knob to edit System Mode, then turn to change from 0 to 1 and vice versa.
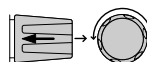
System Mode　　　　0

5. Press the Selector knob or Enter to confirm selection.
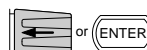
Adjusting the Von Latch Clear

Background   Auto: Load starts when the terminal voltage of module is higher than Von value. The system stops loading when the terminal voltage of module is close to 0V for more than 25ms and system is under the state of detecting Von again.

Manual: The load starts when the terminal voltage of module exceeds the Von setting value. Loading keep going even if the terminal voltage of module close to 0V.

Von Latch: ON
Von Latch Clear: ON

Von Latch: ON
Von Latch Clear: OFF
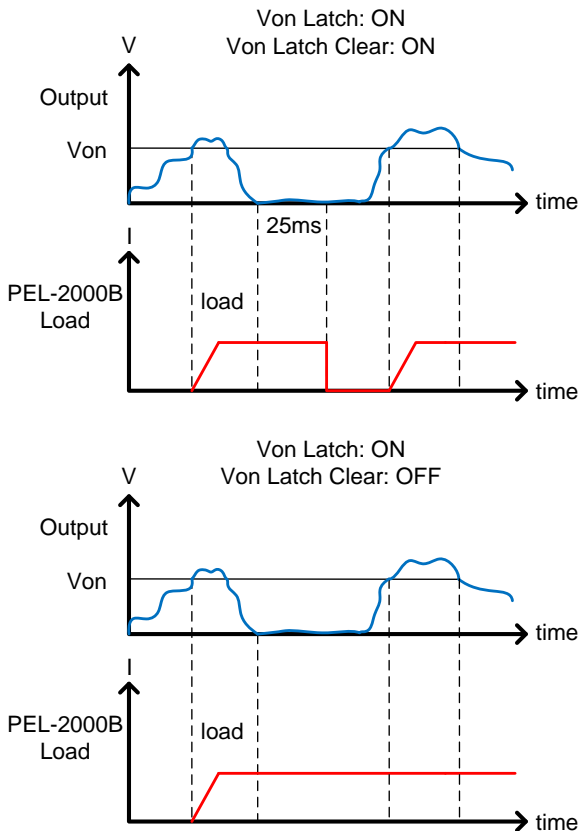
⚠ Note	This feature is only available when Von Latch is set to ON.

Parameters	Von Latch Clear Auto/Manual
Panel operation	1. Press the Shift Key then the Help key to access the Utility menu.
	2. Press F5 (Other Menu).

SHIFT + HELP (UTILITY)

F5

```
05/04/22                        USB
  16 : 50                LOAD
           Other Setting
High Resolution              ON
System Mode                   0
Von Latch Clear            Auto
Measure Period           200ms
Jog Shuttle Control         OFF
```

System Info	Load	Interface	Time Set	Other
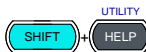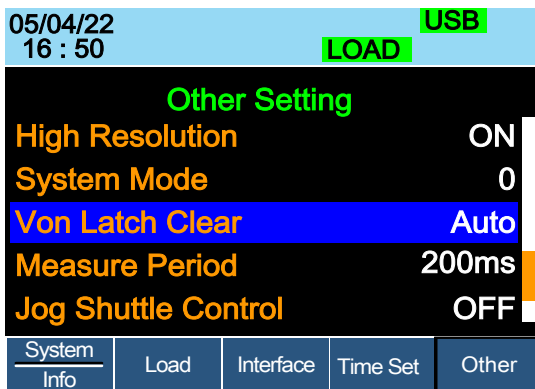
3. Use the Selector knob to highlight Von Latch Clear.
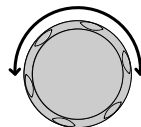
4. Press the Selector knob to edit Von Latch Clear, then turn to change from Auto to Manual and vice versa.
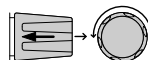
Von Latch Clear   Auto

5. Press the Selector knob or Enter to confirm selection.

Adjusting the Measure Period

Background	You can select a measure sample rate through this setting. 200ms or 20ms are available for voltage and current sampling rate.
Parameter	Measure Period 200ms/20ms
Panel operation	1. Press the Shift Key then the Help key to access the Utility menu.

2. Press F5 (Other Menu).

F5

05/04/22   USB
   16 : 50   LOAD

Other Setting

High Resolution   **ON**
System Mode   **0**
Von Latch Clear   **Auto**
Measure Period   **200ms**
Jog Shuttle Control   **OFF**

System Info	Load	Interface	Time Set	Other
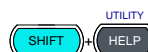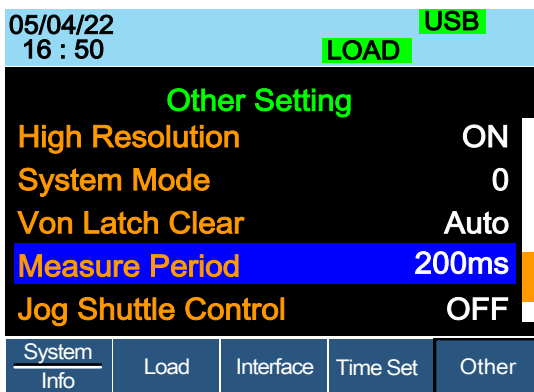
3. Use the Selector knob to highlight Measure Period.
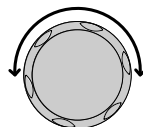
4. Press the Selector knob to edit Measure Period, then turn to change from 200ms to 20ms and vice versa.
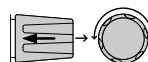
Measure Period   **200ms**

5. Press the Selector Knob or Enter to confirm selection.

or ENTER
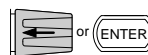
Adjusting the Jog Shuttle Control

Background	ON: After this setting is enabled, the settings value will be adjusted by slave knob in Jog Shuttle mode when you adjust the setting value. The interval value is adjusted according to the knob speed.
	OFF: If this setting is disabled, the settings value will be adjusted by slave knob in the form of fixed compartment when you adjust the setting value.
Parameter	Jog Shuttle Control ON/OFF
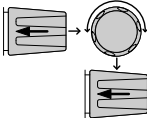
Panel operation
1. Press the Shift Key then the Help key to access the Utility menu.

UTILITY

SHIFT + HELP

2. Press F5 (Other Menu).

F5

05/04/22   USB
 16 : 50   LOAD

Other Setting
High Resolution   ON
System Mode   0
Von Latch Clear   Auto
Measure Period   200ms
Jog Shuttle Control   OFF

| System Info | Load | Interface | Time Set | Other |

3. Use the selector knob to highlight Jog Shuttle Control
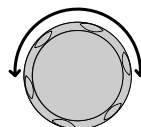
4. Press the Selector knob to edit Jog Shuttle Control, then turn to change from OFF to ON and vice versa.

Jog Shuttle Control OFF
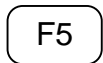
5. Press the Selector knob or Enter to confirm selection.

Adjusting the RVP Load Off

Background	ON: When RVP is detected, Alarm will display on the screen and stop loading. OFF: When RVP is detected, Alarm will display on the screen but loading is kept on.
⚠ Note	This setting applies to all channels. But each channel independently detects RVP and performs the action of emitting alarm and stopping load.
Parameter	RVP Load Off ON/OFF
Panel operation	1. Press the Shift Key then the Help key to access the Utility menu.

UTILITY

SHIFT + HELP

2. Press F5 (Other Menu).

F5

05/04/22   USB
 16 : 50   LOAD

Other Setting
System Mode   0
Von Latch Clear   Auto
Measure Period   200ms
Jog Shuttle Control OFF
RVP Load Off   OFF

| System Info | Load | Interface | Time Set | Other |

3. Use the Selector knob to highlight RVP Load Off.

4. Press the Selector knob to edit RVP Load Off, then turn to change from OFF to ON and vice versa.
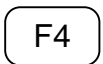
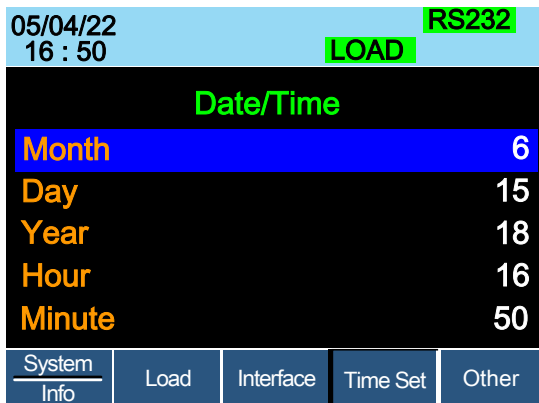<div style="background:blue; color:yellow; padding:4px;">

RVP Load Off   OFF ▌

</div>
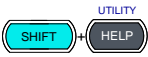
5. Press the Selector Knob or Enter to confirm selection.
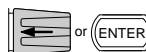
Setting the Date and Time

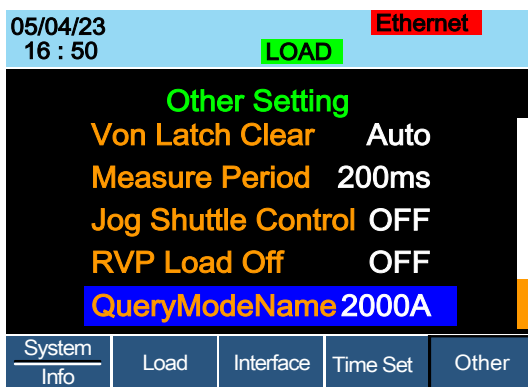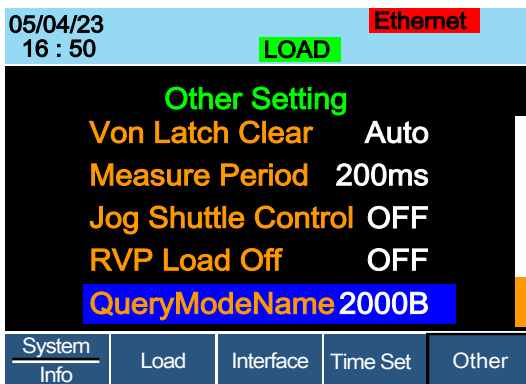|	
Description	The date and time settings are used to time-stamp files when saving files.
	• The date is shown on top of the display.
Parameters	Month	1~12
	Day	1~31
	Year	1990~2038
	Hour	0~23
	Minute	0~59
Panel operation	1. Press the Shift Key then the Help key to access the Utility menu.
	2. Press F4 (Date/Time Menu).
		Settings: Month, Day, Year, Hour, Minute

05/04/22	RS232
16 : 50	LOAD

Date/Time

Month	6
Day	15
Year	18
Hour	16
Minute	50

System Info	Load	Interface	Time Set	Other

Adjusting QueryModeName

Background	Users can adjust the model name to PEL-2000A or PEL-2000B
Parameter	Query Mode Name 2000A/2000B
Panel operation	1. Press the Shift Key then the Help key to access the Utility menu.

UTILITY

SHIFT + HELP

2. Press F5 (Other Menu).

F5

05/04/23	Ethernet
16 : 50	LOAD

Other Setting

Von Latch Clear	Auto
Measure Period	200ms
Jog Shuttle Control	OFF
RVP Load Off	OFF
QueryModeName	2000A

System Info	Load	Interface	Time Set	Other

```
05/04/23                    Ethernet
 16 : 50              LOAD
        Other Setting
     Von Latch Clear    Auto
     Measure Period   200ms
     Jog Shuttle Control  OFF
     RVP Load Off        OFF
     QueryModeName 2000B
  System    Load   Interface  Time Set   Other
   Info
```
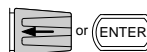
3. Use the Selector knob to highlight QueryModeName.
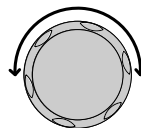
4. Press the Selector knob to edit QueryModeName, then turn to change from 2000A to 2000B and vice versa.
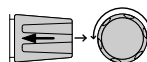
QueryModeName 2000B

5. Press the Selector Knob or Enter to confirm selection.

Saving/Recalling Channels

Background   The PEL-2000A series can save data for up to 120 different channel configurations. Each channel is represented by 120 memory slots using the onboard memory.

Memory is used in program sequences or for individual channel setups. For further details on memory, see page 91.
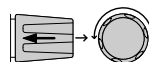
Panel operation   1. Press the File key.

FILE

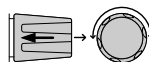2. Press F1 repeatedly until the Media Memory menu appears.

F1

Media Memory	→	Media USB	→	Media Default

```
05/04/22                          USB
 16 : 50                    LOAD
 ─────────────────────────────────────   CH1
 Channel Data         Current            ────
 Data Type            Memory             CCDH

 Memory                 M001



                                         80V
                                         file
 ─────────────────────────────────────
 Media                  Save    Recall
 Memory
```
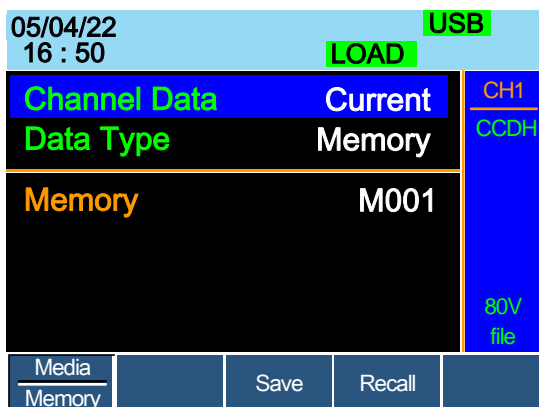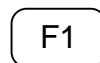
3. Use the Selector Knob to edit Channel Data and Data Type.

4. Choose Current or All and Memory.

Channel Data	Current
Data Type	Memory

5. Press the Selector knob to edit Memory (M001-M120)

       OR

Use the number pad to enter a number.

05/04/22   USB
16 : 50   LOAD

Channel Data	Current	CH1
Data Type	Memory	CCDH
Memory	M001	
		80V file

Media Memory		Save	Recall	
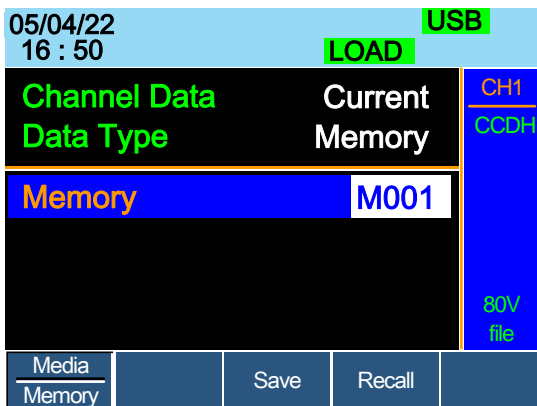
6. Press F3 to Save or F4 to Recall the memory settings.

F3   F4

Save   Recall

7. A message will indicate when a save has been successful

<p style="color:red">Memory No 001 Save OK</p>

⚠️ Note   The display will revert to the channel menu after recalling memory.

Saving/Recalling Preset memory

Background   The PEL-2000A series can store up to 10 presets for
                    each channel. The presets can be saved or recalled
                    either individually for each channel (Channel
                    Data: Current) or at the same time (Channel Data:
                    All), using the All option.

                    For further details on memory, see page 91.
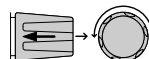
Panel operation   1. Press the File key.

                        FILE

                  2. Press F1 repeatedly until the
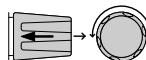   Media Memory menu appears.

                        F1

Media Memory	→	Media USB	→	Media Default

05/04/22   USB
 16 : 50   LOAD
Channel Data   Current   CH1
Data Type   Memory   CCDH
Memory   M001

                                                80V
                                                file

| Media Memory | | Save | Recall | |
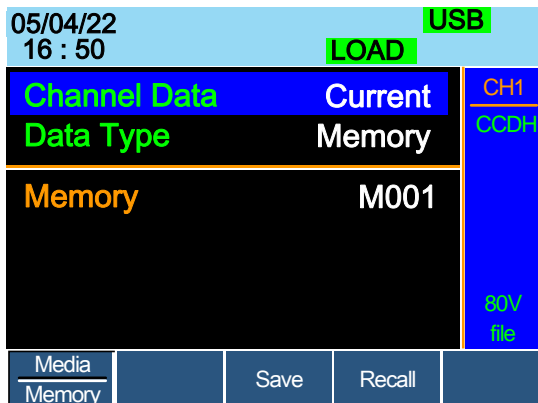
                  3. Use the Selector Knob to edit
                      Channel Data and Data Type.
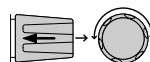
                  4. To save or recall only the active channel, choose
                      Current and Preset. To save or recall all the
                      presets choose All and Preset.

Save / Recall
Current Channel

Channel Data	Current
Data Type	Preset

Save / Recall All
Channels

Channel Data	All
Data Type	Preset

5. Press the Selector knob to edit
    Preset (P0-P9)

    OR

    Use the number pad to enter a
    number.

```
 P7      P8      P9
  7       8       9
 P4      P5      P6
  4       5       6
 P1      P2      P3
  1       2       3
 P0      CAL.    LOCK
  0       •     CLEAR
```

```
05/04/22                        USB
 16 : 50                      LOAD
                                     CH1
Channel Data      Current
Data Type         Preset            CCDH

Preset                    P0

                                     80V
                                     file
  Media
  Memory              Save    Recall
```
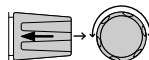
6. Press F3 to Save or F4 to Recall
    the Presets.

    F3 or F4
    ↓   ↓
    Save   Recall
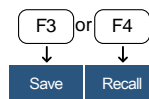
7. A message will be displayed when the save is
    complete.

    Preset P0 Save OK

⚠ Note   The display will revert to the channel menu after
          recalling memory.

Saving/Recalling Setup Memory

Background   The PEL-2000A series can store up to 4 different
                    setups using the onboard memory. Each setup can
                    be saved from the file menu. Using Setup Memory,
                    each channel will be saved. For further details on
                    memory, see page 91.

Panel operation   1. Press the File key.

FILE

2. Press F1 repeatedly until the
    Media Memory menu appears.

F1

Media Memory	→	Media USB	→	Media Default

```
05/04/22                        USB
 16 : 50              LOAD
                                   CH1
Channel Data        Current
                                   CCDH
Data Type           Memory

Memory              M001


                                   80V
                                   file
   Media                  Save   Recall
  Memory
```
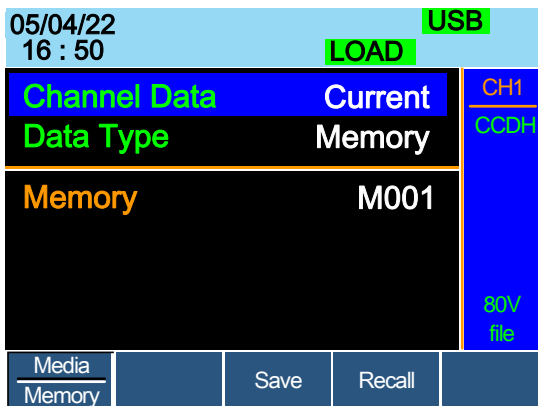
3. Use the Selector Knob to edit
    Channel Data and Data Type.

4. Choose All and Setup.

```
Channel Data              All

Data Type               Setup
```

5. Press the Selector knob to edit Setup Memory (1~4)

   OR

   Use the number pad to enter a number.

```
05/04/22                    USB
 16 : 50                  LOAD

Channel Data          All          CH1
Data Type           Setup          CCDH

Setup Memory            1

                                   80V
                                   file

  Media         Save    Recall
  Memory
```
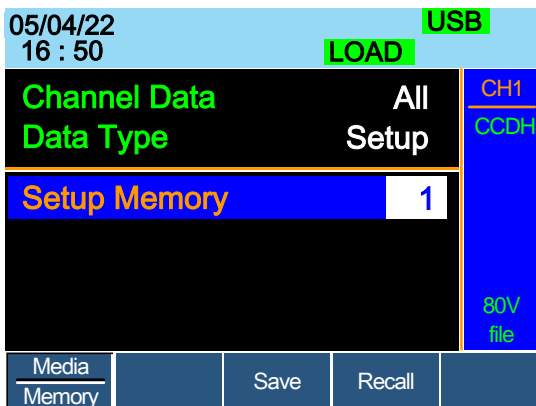
6. Press F3 to Save or F4 to Recall the Setup Memory.

   F3 or F4
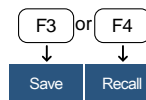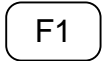
   Save   Recall

7. A message will be displayed when the save/recall is complete.

   Setup Memory 1 Save OK
   Setup Memory 1 Recall OK

Setting the Default USB Path/File

Background | When saving files to a USB memory stick the files will be saved into the root directory if a file path has not been set.

Panel operation | 1. Insert a USB flash drive into the front panel USB slot.

2. Press the File key.

FILE

3. Press F1 repeatedly until the Media USB menu appears.

F1

| Media Memory | → | Media USB | → | Media Default |

```
05/04/22                        USB
 16 : 50                   LOAD
                                          CH1
Save Chan          Current
                                          CCDH
Data Type          Memory

Save File      2030L_00.M
Recall File    2030L_01.M
Path:  usb:
                                          80V
                                          file
 Media              Save   Recall   File
 USB                                Utility
```

4. Press F5 (File Utility).

F5

05/04/22   USB
 16 : 50   LOAD

Path: usb:

usb:\
..\
📂 New folder   05-Nov-13 20:55
📄 UNTITL~1   25-Jul-14 03:16
📂 PIC   29-Dec-13 15:59
📄 Timing   29-Dec-13 16:10
17 folder(s), 13 file(s)

| Select | New Folder | Rename | Delete | Previous Menu |
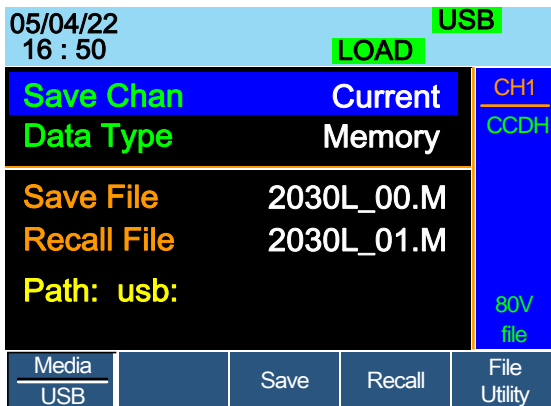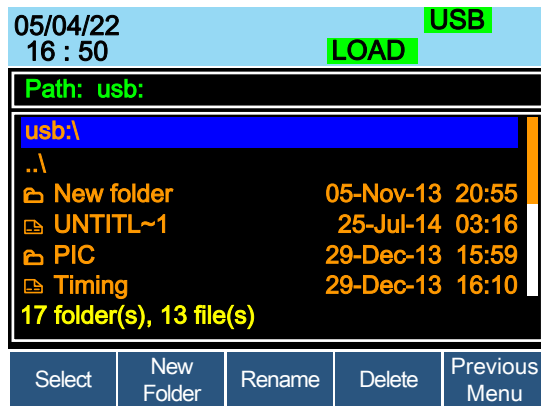
The top section (window) shows the current USB path.

There are 4 options:

- **Select;** Selects the current USB path as the default file path to save. (Step 5)

- **New Folder;** Creates a new folder (Step 7)

- **Rename;** Renames the current folder/path (Step 13)

- **Delete;** deletes the current file/path name. (Step 20)

Select Default Path

5. Use the Selector knob to highlight the new path directory
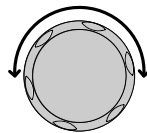
6. Press F1 (Select) to select the new default directory path.

F1

05/04/22   USB
 16 : 50   LOAD

Path: usb:

usb:\
..\
🗁 New folder
🗎 UNTITL~1   25-Jul-14 03:16
🗁 PIC   29-Dec-13 15:59
🗎 Timing   29-Dec-13 16:10
17 folder(s), 13 file(s)

Select	New Folder	Rename	Delete	Previous Menu
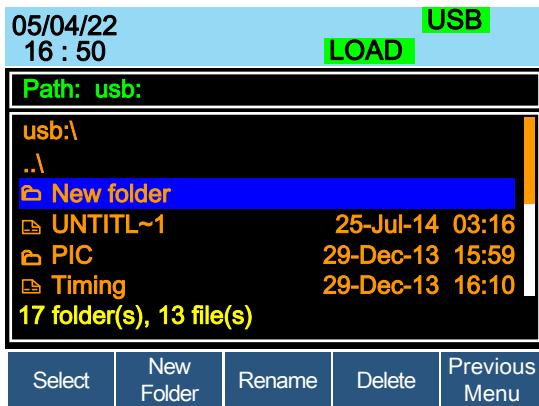
The new path will be shown in the upper Path box in green.

Path: usb\New folder

Create New
Folder

7. To create a new directory, Press F2(New Folder)

F2
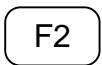
The On-Screen keyboard (OSK) appears. The directory has an 8 character size limit.
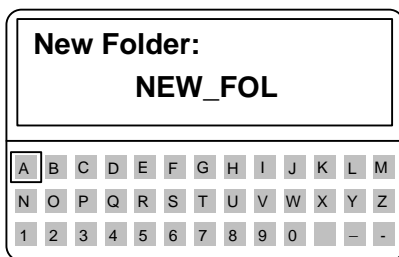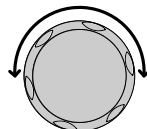
New Folder:

NEW_FOL

A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	2	3	4	5	6	7	8	9	0		_	-

8. Use the Selector knob to scroll left and right through the keys.

9. When a key is highlighted, use the selector knob, F1 or Enter to confirm a key entry.

F1

ENTER
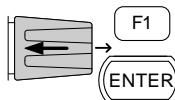
10. Use F2 (Back Space) to delete any previous entries/mistakes.

F2

11. Press F3 (Save) to save the directory name.

F3

12. Press F5 (Previous menu) to continue to the previous menus

F5

Rename Folder   13. Use the Selector knob to highlight the file/directory that needs to be renamed.

05/04/22   USB
  16 : 50   LOAD
Path: usb\New folder

usb:\
..\
  New folder
  UNTITL~1   25-Jul-13 03:16
  PIC   29-Dec-14 15:59
  Timing   29-Dec-14 16:10
17 folder(s), 13 file(s)

| Select | New Folder | Rename | Delete | Previous Menu |

14. Press F3 (Rename)

F3
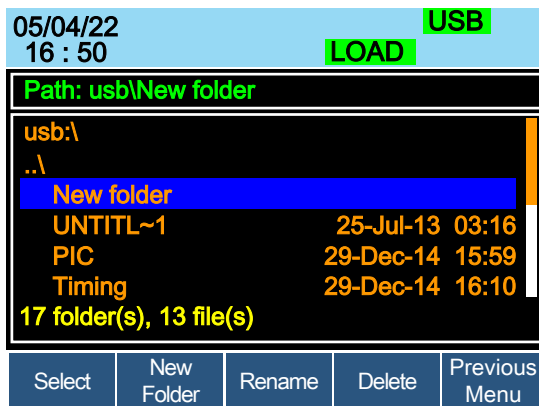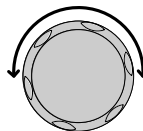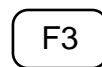
The On Screen Keyboard appears

Rename:
      New folder

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
1 2 3 4 5 6 7 8 9 0   _ -

15. Use the Selector knob to scroll left and right through the keys.
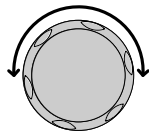
16. When a key is highlighted, use the selector knob, F1 or Enter to confirm a key entry.

F1

ENTER
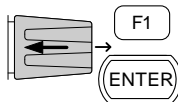
17. Use F2 (Back Space) to delete any previous entries/mistakes.

F2

18. Press F3 (Save) to save the directory name.

F3

19. Press F5 (Previous menu) to continue to the previous menus

F5

Delete File Name 20. Use the Selector knob to highlight a file/directory.

21. Press (F4) Delete.

F4
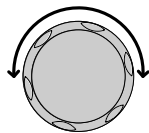
⚠️ Note

If there is any content in the folder, you cannot delete it and the message **Error! This folder may be not empty!** will be displayed on the screen.

22. To confirm deletion, press F4 again.

F4

```
05/04/22
 16 : 50
Path: usb\New folder

usb:\
..\
    New folder
    UNTITL~1                      25-Jul-14  03:16
    PIC                           29-Dec-13  15:59
    Timing                        29-Dec-13  16:10
Press F4 again to confirm this process.
```

Select	New Folder	Rename	Delete	Previous Menu
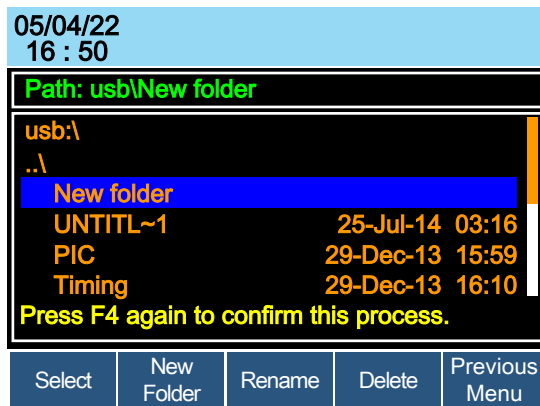
Saving Setups to USB Memory

Background	Setup data contains all the channel data including Memory, Presets and Program Sequences.
	There are four setups in internal memory. When saving to USB, all four setups will be saved. Conversely, when recalled, all four setups will be recalled to main memory.
	The file extension *.S is used for Setup data only.
Parameters	Save File 200X0_XX.S
Panel operation	1. Insert a USB flash drive into the front panel USB slot.
	2. Ensure the USB path has been set. Page 229.
	3. Press the File key.
	FILE
	4. Press F1 repeatedly until the Media USB menu appears. **F1**

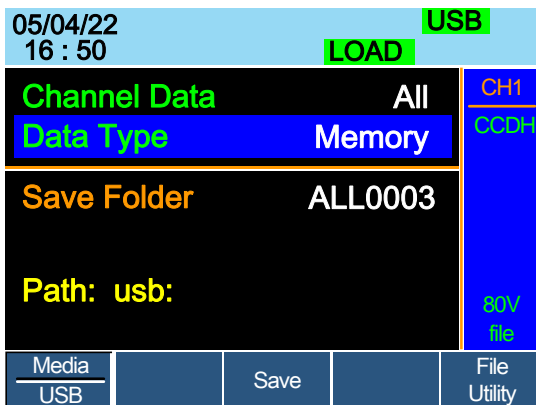| Media Memory	→	Media USB	→	Media Default

05/04/22
16 : 50

USB

LOAD

| Channel Data | Current | CH1 |
| Data Type | Memory | CCDH |

Save File 2030L_01.M
Recall File 2030L_00.M
Path: usb:

80V
file

| Media USB | | Save | Recall | File Utility |

5. Use the Selector Knob to edit Save Chan and Data Type.

6. Choose All and Setup.

Channel Data   All

Data Type   Setup

05/04/22
16 : 50

USB

LOAD

| Channel Data | All | CH1 |
| Data Type | Setup | CCDH |

Save File 20040_01.S
Recall File 20040_00.S
Path: usb:

80V
file

| Media USB | | Save | Recall | File Utility |
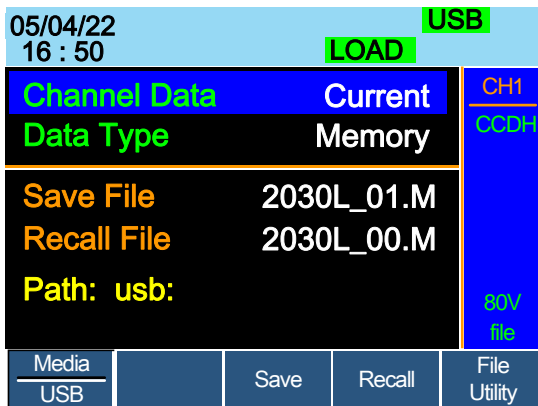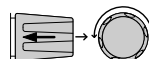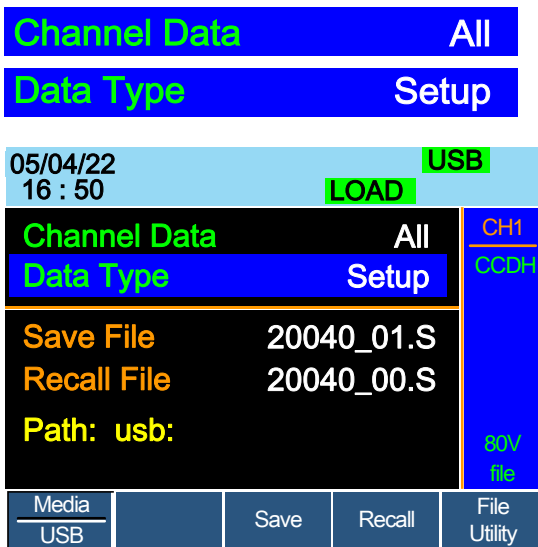
The screen will update to only show Setup files (*.S) that are available to save/recall in the root directory. Press F5 (File Utility) to select the directory to save.

Save/ Recall Setups to USB	7. Use the Selector Knob to edit Save File or Recall File. Rotating the selector knob will scroll through all the available setup files (*.S).
	8. Choose a file name.
	9. Press F3 (Save) to save the setup data or F4 (Recall) to recall the setup data.
	10. A screen message will appear when the save/recall has completed.
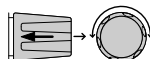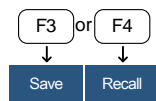
<div style="color:red; font-size:larger;">

20040_01.S Save Ok

20040_00.S Recall Ok

</div>

/!\ Note   Setups can only be saved if they have been saved to internal memory first. For details on how to save to internal memory see page 227.

Saving/Recalling Memory Data to USB

Background	There are two options to save or recall Memory data to a USB flash drive:
	Save Chan Current: Saves the active Channel's Memory data (M001~M120) into the root directory (20XXX_XX.M). Press F5 (File Utility) to select the directory to save.
	Save Chan All: Every channel's Memory data (CH1 M001~120 ~ CH8 M001~M120) will be saved into a directory (ALL00XX) as separate files for each channel (P0X0X_C1.M ~ P0X0X_C8.M).
	Recall File: Recalls the selected file to the active channel's Memory. It is not possible to update all the channels at once, only one channel at a time can be recalled.

The file extension *.M is used for Memory data only.

For more information about the file structures see, page 91.

Parameters	Save Channel Data: All	Directory ALL0000 ~ ALL0099 File: P0X0X_CX.M
	Save Channel Data: Current	File: 20XXX_XX.M
	Recall Channel Data: Current	File: 20XXX_XX.M

Panel operation

1. Insert a USB flash drive into the front panel USB slot.

2. Ensure the USB path has been set.

3. Press the File key.

   FILE

4. Press F1 repeatedly until the Media USB menu appears.

   F1

   Media Memory → Media USB → Media Default

   05/04/22   USB
    16 : 50   LOAD

   Channel Data   Current   CH1
   Data Type   Memory   CCDH

   Save File   2030L_01.M
   Recall File   2030L_00.M

   Path: usb: 80V
                                        file

   | Media USB | | Save | Recall | File Utility |

Save all Channels   5.   Use the Selector knob to edit Save Chan and Data Type.
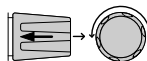
6.   Choose All, and Memory

Channel Data	All
Data Type	Memory

05/04/22
16 : 50   **USB**   **LOAD**

Channel Data	All	CH1
Data Type	Memory	CCDH
Save Folder	ALL0003	
Path: usb:		80V file

Media USB		Save		File Utility

The screen updates to show Save Folder. Note it is not possible to recall all channels at once, only save.
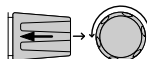
7.   Use the Selector Knob to edit Save Folder.

8.   Choose a directory name (ALL0000 ~ ALL0099).

Save Folder	ALL0003

⚠️ Note   Any used directories will not be available. It is not possible to over-write older directories. They must be deleted first.

9.   Press F3 (Save)

F3
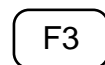
10. A screen message will be displayed when complete.

ALL0003 Save Ok

Save /Recall File   11. Use the Selector Knob to edit Save Chan and Data Type.
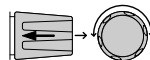
12. Choose Current and Memory.

Channel Data   Current

Data Type   Memory

| 05/04/22   USB | |
16 : 50 LOAD	
Channel Data Current	CH1
Data Type Memory	CCDH
Save File 2030L_00.M	
Recall File 2020L_01.M	
Path: usb:	80V
	file

| Media USB | | Save | Recall | File Utility |
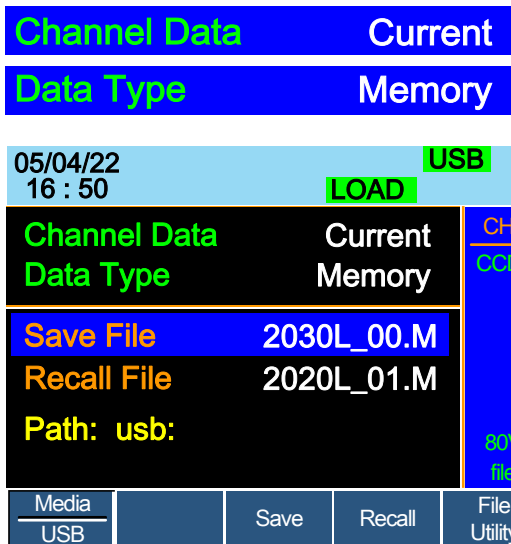
13. Use the selector knob to edit Save or Recall File.

14. Choose a file name.

15. Press F3 (Save) to save or F4 (Recall) to recall the current channel memory.

F3 or F4
↓   ↓
Save Recall
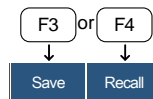
16. A save or recall message will be displayed when complete.

2030L_00.M Save Ok
2030L_00.M Recall Ok

Recall File from USB path

17. Press F5 (File Utility).

18. Use the selector knob to select path for saving memory. usb:\ALLXXXX\File: 2XXXX_XX.M
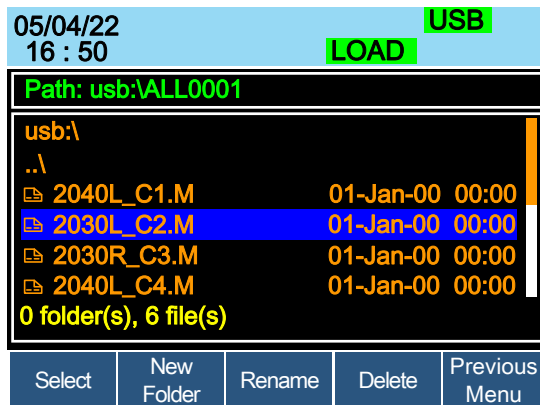
```
05/04/22                          USB
 16 : 50                    LOAD
Path: usb:\ALL0001

usb:\
..\
  2040L_C1.M        01-Jan-00  00:00
  2030L_C2.M        01-Jan-00  00:00
  2030R_C3.M        01-Jan-00  00:00
  2040L_C4.M        01-Jan-00  00:00
0 folder(s), 6 file(s)

  Select    New      Rename   Delete   Previous
            Folder                     Menu
```
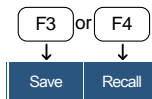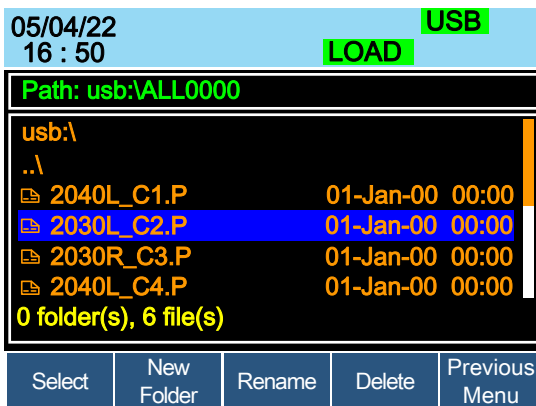
19. Press the selector knob, Enter or F1

20. A recall message will be displayed when complete.

```
05/04/22                          USB
 16 : 50                    LOAD
Path: usb:\ALL0000

usb:\
..\
  2040L_C1.M        01-Jan-00  00:00
  2030L_C2.M        01-Jan-00  00:00
  2030R_C3.M        01-Jan-00  00:00
  2040L_C4.M        01-Jan-00  00:00
Recall complete

  Select    New      Rename   Delete   Previous
            Folder                     Menu
```
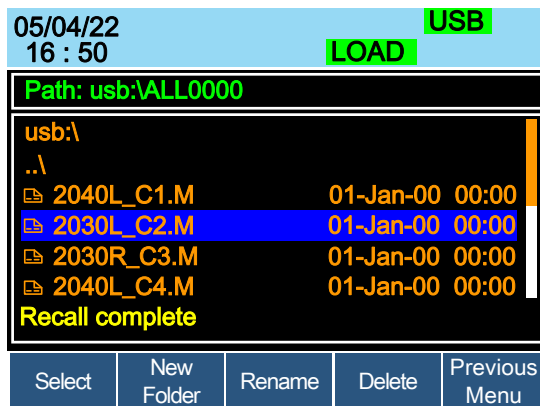
⚠ Note
Remember only data that has been saved to internal memory will be saved to USB. Only the active channel will be saved.

If you try to recall data that originated from a different load module than the active channel, an error message will appear. The filename must reflect the active channel's load module type.

Machine Type Error

Saving/Recalling Presets to USB

Background   There are two options to save or recall Channel Presets to a USB flash drive:

Save Chan Current: Saves the active Channel's Presets (P0~P9) into the root directory (20XXX_XX.P). Press F5 (File Utility) to select the directory to save.

Save Chan All: Every channel's Presets (CH1 P0~P9 ~ CH8 P0~P9) will be saved into a directory (ALL00XX) as separate files for each channel (P0X0X_C1.P ~ P0X0X_C8.P)

Recall: Recalls the selected file to the active channel's Presets (P0~P9). It is not possible to update all the channels at once, only one channel at a time can be recalled.

The file extension *.P is used for channel Presets only.

For more information about the file structures see page 91.

Parameter	Save Channel Data: All	Directory: ALL0000 ~ ALL0099 File: P0X0X_CX.P
	Save Channel Data: Current	File: 20XXX_XX.P
	Recall Channel Data: Current	File: 20XXX_XX.P

Panel operation

1. Insert a USB flash drive into the front panel USB slot.
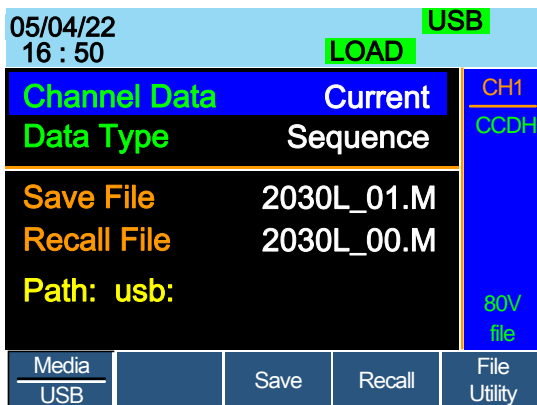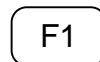
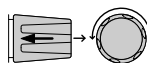2. Ensure the USB path has been set. Page 229.

3. Press the File key.

    FILE

4. Press F1 repeatedly until the Media USB menu appears.

    F1

| Media Memory | → | Media USB | → | Media Default |

```
05/04/22                        USB
 16 : 50                    LOAD
Channel Data          Current        CH1
Data Type             Memory         CCDH

Save File          2030L_01.M
Recall File        2030L_00.M
Path:  usb:
                                     80V
                                     file
 Media USB                Save  Recall  File Utility
```
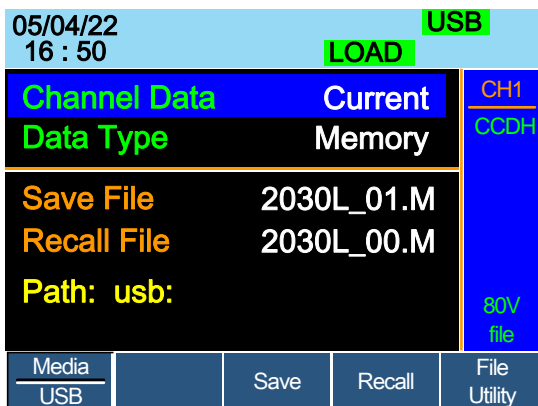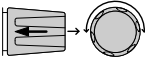
Save all Channel Presets

5. Use the Selector knob to edit Save Chan and Data Type.

6. Choose All, and Preset

```
Channel Data              All
Data Type              Preset
```

```
05/04/22                          USB
  16 : 50                   LOAD
                                          CH1
Channel Data              All
Data Type              Preset            CCDH

Save Folder            ALL0000


Path:  usb:                               80V
                                          file

   Media                          File
   USB              Save          Utility
```
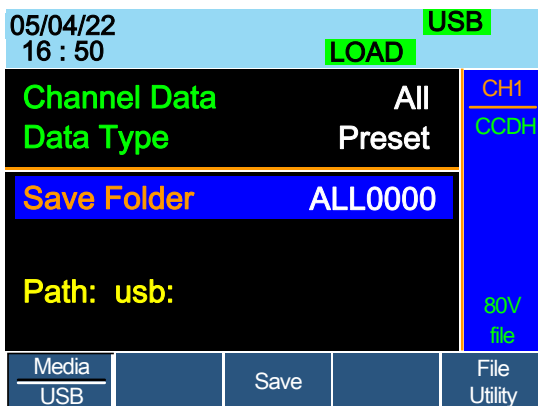
The screen updates to show Save Folder. Note it is not possible to recall all presets at once, only save.

7. Use the Selector Knob to edit Save Folder.

8. Choose a directory name (ALL0000 ~ ALL0099).

Save Folder   ALL0000

⚠ Note   Any used directories will not be available. It is not possible to over- write older directories. They must be deleted first.
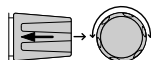
9. Press F3 (Save)

F3

10. A screen message will be displayed when the save is complete.
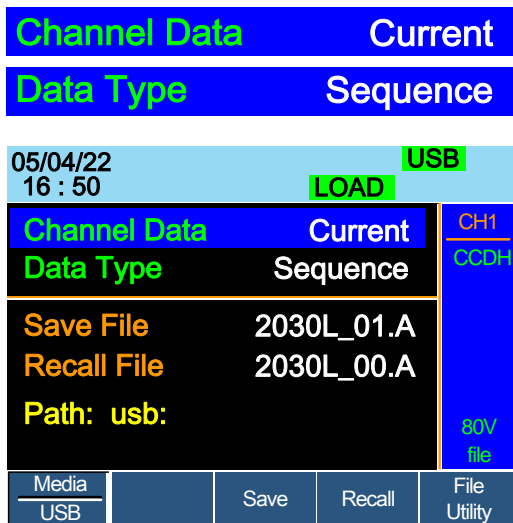
ALL0001 Save Ok

Save/Recall Preset 11. Use the Selector Knob to edit
(current channel)   Save Chan and Data Type.
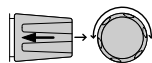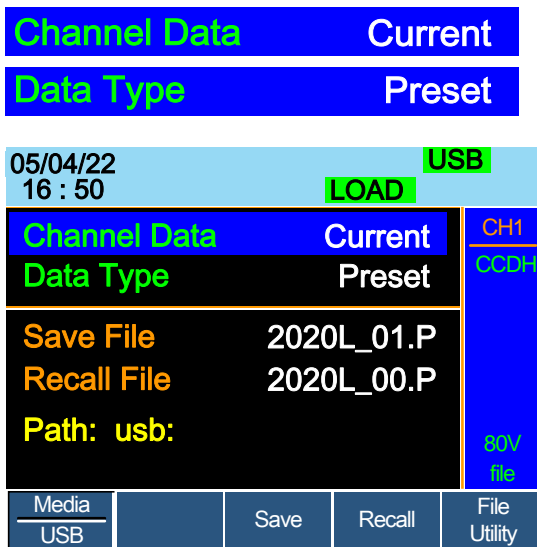
12. Choose Current and Preset.

Channel Data	Current
Data Type	Preset

05/04/22
16 : 50

USB
LOAD

Channel Data	Current
Data Type	Preset

CH1
CCDH

Save File	2020L_01.P
Recall File	2020L_00.P

Path: usb:

80V
file

Media USB		Save	Recall	File Utility

13. Use the selector knob to edit Save File or Recall file.
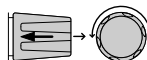
14. Choose a file name.

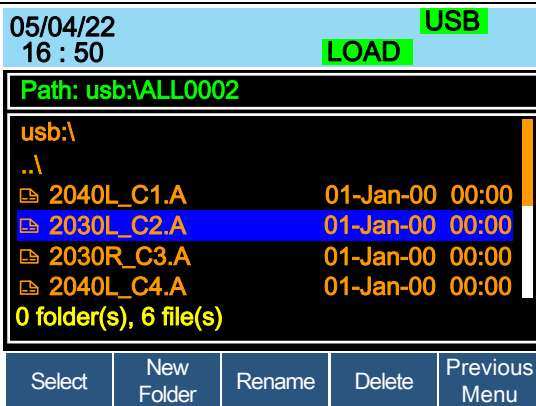15. Press F3 (Save) to save or F4 (Recall) to recall the Channel Presets.

F3 or F4
↓ ↓
Save Recall

16. A message will be displayed when the save or recall has completed.

2020L_01.P Save Ok
2020L_01.P Recall Ok
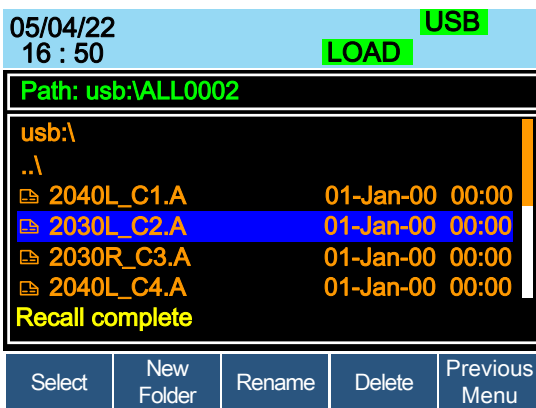
Recall File from USB path

17. Press F5 (File Utility).

18. Use the selector knob to select path for saving preset. usb:\ALLXXXX\File: 20XXX_XX.P

05/04/22		USB
16 : 50		LOAD

Path: usb:\ALL0000

usb:\
..\
  📄 2040L_C1.P   01-Jan-00 00:00
  📄 2030L_C2.P   01-Jan-00 00:00
  📄 2030R_C3.P   01-Jan-00 00:00
  📄 2040L_C4.P   01-Jan-00 00:00
0 folder(s), 6 file(s)

Select	New Folder	Rename	Delete	Previous Menu

19. Press the selector knob, Enter or F1.

20. A recall message will be displayed when complete.

05/04/22		USB
16 : 50		LOAD

Path: usb:\ALL0000

usb:\
..\
  📄 2040L_C1.P   01-Jan-00 00:00
  📄 2030L_C2.P   01-Jan-00 00:00
  📄 2030R_C3.P   01-Jan-00 00:00
  📄 2040L_C4.P   01-Jan-00 00:00
Recall complete

Select	New Folder	Rename	Delete	Previous Menu
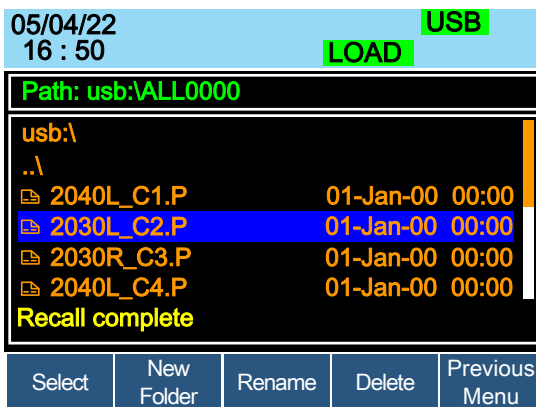
⚠️Note   Remember only data that has been saved to internal memory will be saved to USB. Only the active channel presets will be saved.

If you try to recall data that originated from a different load module than the active channel, an error message will appear. The filename must reflect the active channel's load module type.

Machine Type Error

Saving/Recalling Sequences to USB

Background   There are two options to save or recall Sequences to a USB flash drive. Sequences can either be saved from all channels or from the current channel only.

Save All: Every channels' sequences will be saved into a directory (ALL00XX) as separate files for each channel (20XXX_C1.A~ 20XXX_C8.A).

Save Current: The current channel's sequence will be saved into the root directory (20XXX_XX.A). Press F5 (File Utility) to select the directory to save.

Recall: Sequences can only be recalled for the current channel. It is not possible to recall all channels' Sequences at once.

The file extension *.A is used for Sequences only.

For more information about the file structures see page 91.

Parameters   Save Channel Data:Directory: ALL0000 ~ ALL0099
                  All   File: 20XXX_CX.A

Save Channel Data:File: 20XXX_XX.A
Current

Recall Channel   File: 20XXX_XX.A
Data: Current

Panel operation	1. Insert a USB flash drive into the front panel USB slot.
	2. Ensure the USB path has been set. Page 229.
	3. Press the File key.

FILE

4. Press F1 repeatedly until the Media USB menu appears.

F1

| Media Memory | → | Media USB | → | Media Default |

```
05/04/22                        USB
 16 : 50                    LOAD
 Channel Data        Current       CH1
 Data Type           Sequence      CCDH

 Save File        2030L_01.M
 Recall File      2030L_00.M
 Path:  usb:
                                   80V
                                   file
 Media                 Save  Recall  File
 USB                                 Utility
```

| Save all Channel SEQ | 5. Use the Selector knob to edit Save Chan and Data Type. |
| | 6. Choose All, and Sequence |

| Channel Data | All |
| Data Type | Sequence |
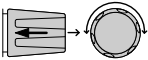
05/04/22   USB
16 : 50   LOAD

Channel Data   All   CH1
Data Type   Sequence   CCDH

Save Folder   ALL0000

Path: usb: 80V
file

| Media USB | | Save | | File Utility |
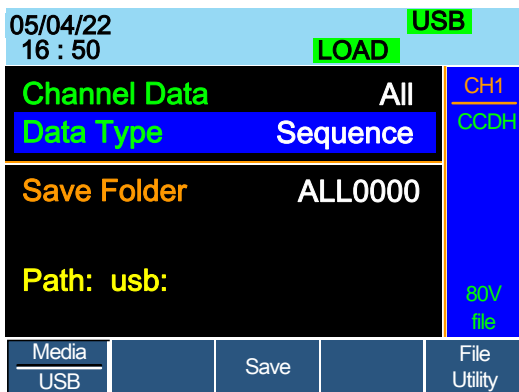
The screen updates to show Save Folder. Note it is not possible to recall all Sequence data at once, only save.

7. Use the Selector Knob to edit Save Folder.

8. Choose a directory name (ALL0000~ALL0099).

Save Folder   ALL0000

⚠️ Note   Any used directories will not be available. It is not possible to over-write older directories. They must be deleted first.

9. Press F3 (Save)

F3
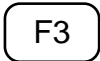
10. A screen message will be displayed when saving.

Save All Chan in ALL0000

Save/Recall SEQ (current channel)   11. Use the Selector Knob to edit Save Chan and Data Type.

12. Choose Current and Sequence.

Channel Data   Current

Data Type   Sequence

05/04/22   **USB**
 16 : 50   **LOAD**

| Channel Data | Current | CH1 |
| Data Type | Sequence | CCDH |

Save File   2030L_01.A
Recall File   2030L_00.A
Path: usb: 80V
                                          file

| Media USB | | Save | Recall | File Utility |

13. Use the selector knob to edit Save File or Recall File.

14. Choose a file name.

15. Press F3 (Save) to save or F4 (Recall) to recall the current channel's sequence.

    [F3]   [F4]

    Save   Recall

16. A message will be displayed when the file is saved/recalled.

2030L_01.A Save OK
2030L_01.A Recall OK

Recall File from USB path

17. Press F5 (File Utility).

18. Use the selector knob to select path for saving sequence. usb:\ALLXXXX\File: 20XXX_XX.A

249

```
05/04/22                          USB
 16 : 50                    LOAD
Path: usb:\ALL0002
usb:\
..\
  2040L_C1.A          01-Jan-00  00:00
  2030L_C2.A          01-Jan-00  00:00
  2030R_C3.A          01-Jan-00  00:00
  2040L_C4.A          01-Jan-00  00:00
0 folder(s), 6 file(s)
```

| Select | New Folder | Rename | Delete | Previous Menu |

19. Press the selector knob, Enter or F1.

20. A recall message will be displayed when complete.

```
05/04/22                          USB
 16 : 50                    LOAD
Path: usb:\ALL0002
usb:\
..\
  2040L_C1.A          01-Jan-00  00:00
  2030L_C2.A          01-Jan-00  00:00
  2030R_C3.A          01-Jan-00  00:00
  2040L_C4.A          01-Jan-00  00:00
Recall complete
```

| Select | New Folder | Rename | Delete | Previous Menu |

⚠Note

Remember a sequence must first be saved to (internal) buffer before it can be saved to USB.

If you try to recall data that originated from a different load module than the active channel, an error message will appear. The filename must reflect the active channel's load module type.

Machine Type Error

Quick Preset Recall/Save

Background	The PEL-2000A series mainframes have up to 10 Channel Presets (P0~P9). Quick recalling or saving presets will only be applicable to the active channel. For example, P1 on CH1 is not the same as P1 on CH2.
Parameter	Presets P0 ~ P9 (current channel)
Panel Operation	1. Remove any USB devices from the front panel.
	2. Select the channel you want to save Channel Presets to. Page 123.

Save Current Channel Preset	3. To save a Channel Preset, press the Preset key and hold one of the number keys (0-9) for a short time until a beep is heard.	P0 PRESET + 0
	0 = P0 1= P1 etc.	
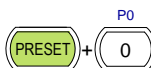
Save All Channel Presets	4. To save All Channel Presets, press the Shift key, the Preset key and hold one of the number keys (0-9) for a short time until a beep is heard.	SHIFT + PRESET + P0 0
	0 = P0 1= P1 etc.	
	5. Press the Preset key again to deactivate it.	PRESET → PRESET
	The Preset will be saved to the one of 10 presets depending on the number pressed.	
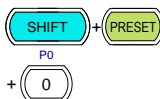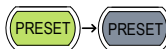
Recall Current Channel Preset	6.	Press the Preset key and one of the number keys.	
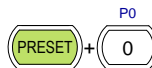
0 = P0
1= P0 etc.

Only the current Channel preset will be recalled.

Recall All Channel Presets	7.	Press the Shift key, the Preset key and one of the number keys.	
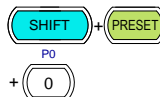
0 = P0
1= P0 etc.

8. Press the Preset key again to deactivate it.

Recall Setup Memory (Frame link).

Background	A master mainframe can command all mainframes (master and slave) to recall setup memory from their internal memory. No setup data will be recalled from the master mainframe to the slave units.
Parameter	Setup memory 1~4.
Panel Operation	1. On the Master mainframe, follow the procedure for recalling setup memory for all channels. Page 226

All mainframes will update setup memory upon recall. |

⚠️Note It is necessary to save setup data before recalling both master and slave. If the setup data is not saved first, there will be no value change after recalling.

Recall Preset Memory (Frame link)

Background	A master mainframe can command all units to recall preset memory from their internal memory. Only the first three preset memories (P0~P2) can be recalled.
	Channel presets can be recalled via the file menu or using the quick recall feature using the number pad.
Parameters	Presets P0 ~ P2 (current channel)
Panel Operation: Quick Keys	1. Remove any USB devices from the front panel.
	2. On the master mainframe, press the Shift and Preset key. $\boxed{\text{SHIFT}}$ + $\boxed{\text{PRESET}}$
	3. Press one of the number keys (0-2). $\begin{array}{c}\text{P0}\\\boxed{0}\end{array}$
	0 = P0 1= P1 etc
	The screen will flash momentarily when the presets are recalled.
Panel Operation: File menu	4. On the master mainframe follow the procedure to recall preset memory for all channels. Page 225
	The screen will flash momentarily when the presets are recalled.
⚠️Note	It is necessary to save preset data before recalling both master and slave. If preset data is not saved first, the value after recalling will be the factory default setting.
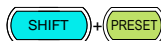
Recall Factory/User's Defaults

Background   The Factory/User's defaults can be saved or recalled at any time. For details on the factory defaults please see the default settings in the appendix, page 307

Panel Operation   1. Press the File key.

FILE

2. Press F1 repeatedly until the Media Default menu appears.

F1

Media		Media		Media
Memory	→	USB	→	Default

05/04/22
16 : 50
USB
LOAD

Load Default Setup

CH2
CCH

500V
file

Media Default	Factory Default	Save	Recall	

3. Press Factory Default (F2) to recall the factory default settings.

F2

05/04/22
16 : 50

USB

LOAD

CH2

CCH

Load Default Setup

**Warning! Press F2 again will
Recall Factory Default!**

500V
file

| Media Default | Factory Default | Save | Recall | |

4. Press F2 again to ensure recall factory default setting

F2

05/04/22
16 : 50

USB

LOAD

CH2

CCH

Load Default Setup

**Recall Factory Default,
Please Wait...**

500V
file
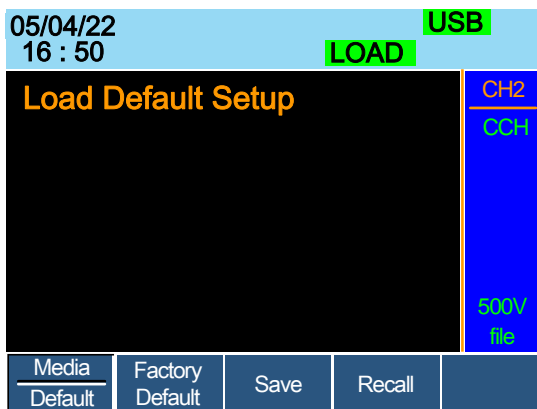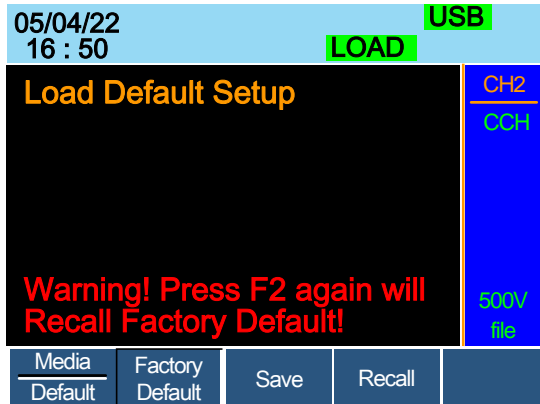
| Media Default | Factory Default | Save | Recall | |
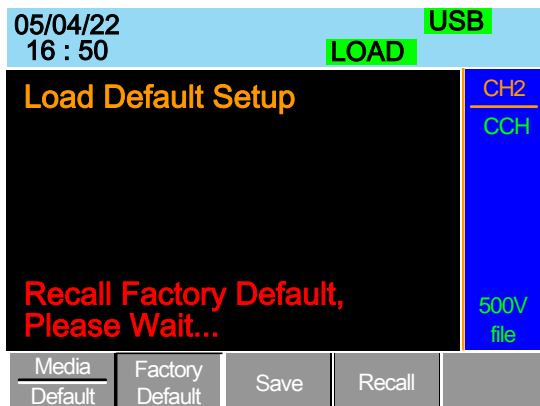
5. Wait a short time for the settings to be recalled.

6. Press Save (F3) to save the user's default.

F3

05/04/22   USB
16 : 50   LOAD

Load Default Setup

CH1
CCH

Warning! Press F3 again will
Save User's Default!

500V
file

| Media Default | Factory Default | Save | Recall | |
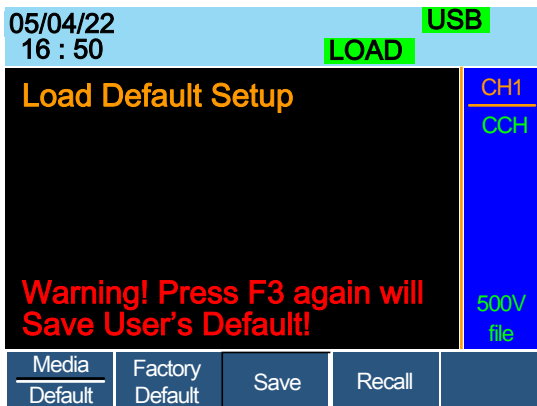
7. Press Save (F3) again to ensure save the user's default.

F3

8. Wait a short time for the settings to be saved.

05/04/22   USB
16 : 50   LOAD

Load Default Setup

CH1
CCH

User's Default Save Ok

500V
file

| Media Default | Factory Default | Save | Recall | |
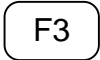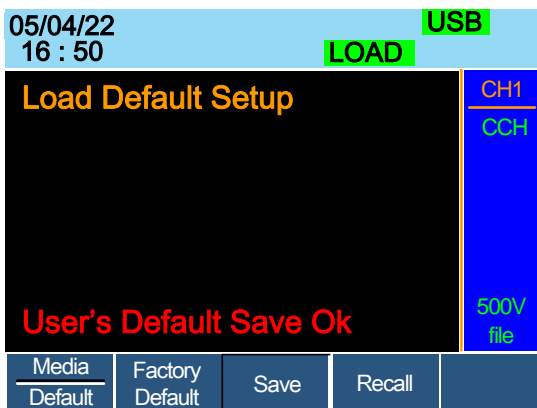
9. Press Recall (F4) to recall the user's default.

F4

05/04/22			USB	
16 : 50		LOAD		CH1
Load Default Setup				CCH
Warning! Press F4 again will Recall User's Default !				500V file
Media Default	Factory Default	Save	Recall	
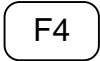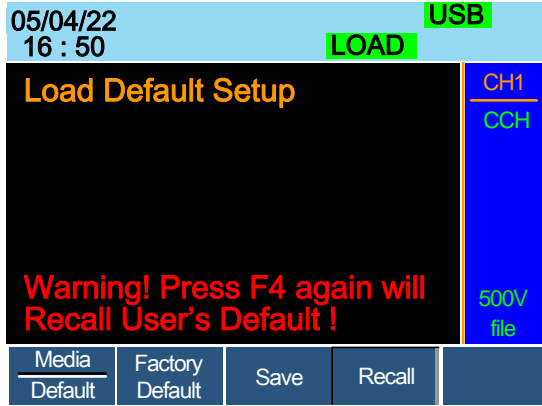
10. Press Recall (F4) to ensure recall the user's default

F4

11. Wait a short time for the settings to be saved.

05/04/22			USB	
16 : 50		LOAD		CH1
Load Default Setup				CCH
Recall User's Default...				500V file
Media Default	Factory Default	Save	Recall	
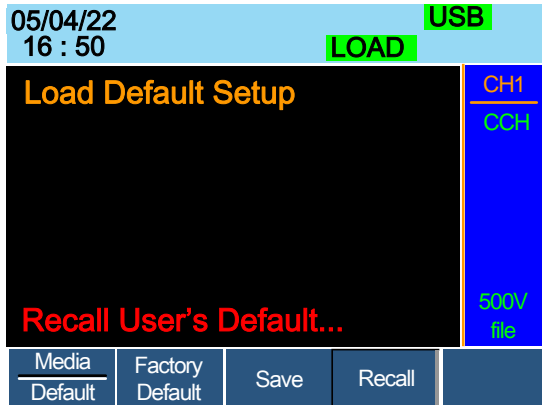
INTERFACE

The Interface chapter details the pin configuration of the UART, LAN, GPIB, Frame Link, Channel Control and Go/NoGo interfaces.

Interface Configuration

The Interface Configuration chapter describes configuration settings that apply when using the PEL-2000A mainframe with a remote connection. There are three interface options for remote control: UART, GPIB, LAN and USB. Only one interface can be used at a time.

Configure Channel Control interface

Channel control configuration	Connector	Screwless connector.
	Wire Gauge	22-28 AWG (24 AWG recommended).
	Wire connection	10 mm strip gauge for connection.

10.0 mm
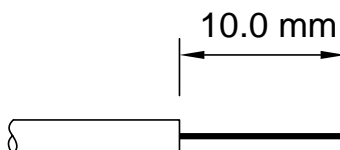
	Input	0-10V.

Pin Assignment	1 6	
1	GND	Negative potential of the load input terminal.
2	I MON (OUTPUT)	Load input current monitor; where 0V = 0% of input current and 10V = 100% of input current.
3	V MON (OUTPUT)	Load input voltage monitor; where 0V = 0% of input voltage and 10V = 100% of input voltage.

4	Ext Voltage ref (INPUT)	External voltage reference; Where 0V=0% of rating voltage/current and 10V = 100% of rating voltage/current. The external voltage reference is for CC and CV mode.
5	Load On	Load On Input. Load on = Active low. Load off = Active high. (Pin 5 of the connector is internally pulled up to 3.3V with a 10kΩ resistor when the switch is open. Thus when the switch is open, pin 5 is logically high. When the switch is closed, pin 5 is pulled down to the GND ground level, making pin 5 logically low)
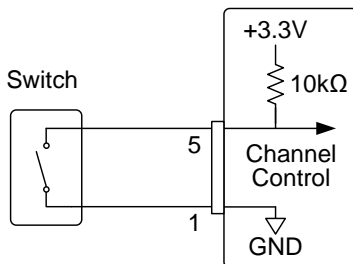
The Load On/Off determines whether the external switch is closed (low) or open (high)
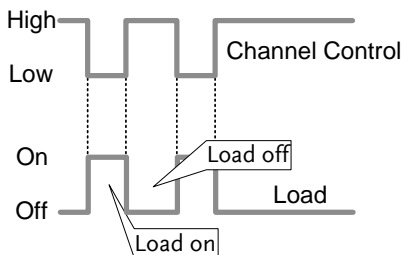
6	+15V	Internal power output. Max 50mA.
Channel Control Interface Constraints	Mode/Range	Mode and Range configuration is only selected via the front panel.

Configure Frame Link Interface

Connection	Connect the Frame link cable (MIL 20 pin connector) to the rear panel port: 20-pin male connector.	

Pin assignment (Frame link connector 1)
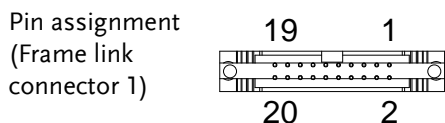
Pin number	Pin name	Description
Pin1	A	Input, Recall Preset memory 0 (All channels)
Pin2	B	Input, Recall Preset memory 1 (All channels)
Pin3	C	Input, Recall Preset memory 2 (All channels)
Pin4	TRIG_IN	Trigger input
Pin5	MEM_1	Input, Recall Setup memory 1 (All channels)
Pin6	MEM_2	Input, Recall Setup memory 2 (All channels)
Pin7	MEM_3	Input, Recall Setup memory 3 (All channels)
Pin8	MEM_4	Input, Recall Setup memory 4 (All channels)

Pin9	Enable	Input, Enable Load (On/Off), recall Preset memory (0-2) and Setup memory (1-4)
Pin10	Load On/Off	Input, Load On/Off
Pin11	N.C	No connection
Pin12	N.C	No connection
Pin13	N.C	No connection
Pin14	N.C	No connection
Pin15	Load Status	Output, load on status.
Pin16	Alarm Status	Output, alarm activated.
Pin17	+5V	Power source output, +5V, 100mA.
Pin18	N.C	No connection.
Pin19	GND	Ground
Pin20	GND	Ground

Pin assignment (Frame link connector 2)

19   1
20   2
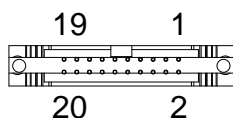
Pin number	Pin name	Description
Pin1	Sync._A	Output, Sync signal, Recall Preset memory 0 (All channels)
Pin2	Sync._B	Output, Sync signal, Recall Preset memory 1 (All channels)

Pin3	Sync._C	Output, Sync signal, Recall Preset memory 2 (All channels)
Pin4	TRIG_OUT	Trigger output
Pin5	Sync._MEM_1	Output, Sync signal, Recall Setup memory 1 (All channels)
Pin6	Sync._MEM_2	Output, Sync signal, Recall Setup memory 2 (All channels)
Pin7	Sync._MEM_3	Output, Sync signal, Recall Setup memory 3 (All channels)
Pin8	Sync._MEM_4	Output, Sync signal, Recall Setup memory 4 (All channels)
Pin9	Sync._Enable	Output, Sync signal, Enable Load (On/Off), recall Preset memory (0-2) and Setup memory (1-4)
Pin10	Sync._Load On/Off	Output, Sync signal, Load On/Off
Pin11	N.C	No connection
Pin12	N.C	No connection
Pin13	N.C	No connection
Pin14	N.C	No connection
Pin15	Load Status	Output, load on status.
Pin16	Alarm Status	Output alarm activated.
Pin17	N.C	No connection

Pin18	+5V	Power source output, +5V, 100mA
Pin19	GND	Ground
Pin20	GND	Ground

Explanation	• Input: active low (0-1V) active high (4-5V)

⚠ Note	Input type is internally pulled up to 5V with a 10kΩ resistor.

	• Output: high (floating) low (0-1V)

⚠ Note	Output type is internally Open collector outputs, maximum 30VDC with 1.1V saturation voltage (100mA).

	• When Enable (pin9) is on (active low), the following is disabled from the mainframe: Load On/Off (pin 10) activating loads and recalling preset (pin 1-3) or setup memory (pin 5-8).

Frame Link constraints	• Maximum 5 (1 master + 4 slave units) devices can be linked altogether with a maximum cable length of 30cm for each cable.
	• All the connected devices must be turned on.
	• No loop or parallel connections

Configure Go/NoGo Interface

Connection	Use a DSUB (DB-15 Female) connector to connect to the Go/NoGo port. The Go/NoGo port is an output only port.	GO / NG OUTPUT
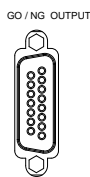
Pin assignment
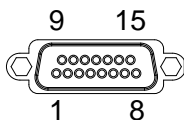
Pin1	Ch1_GO/NG	Pin9	Ch5_GO/NG
Pin2	GND	Pin10	GND
Pin3	Ch2_GO/NG	Pin11	Ch6_GO/NG
Pin4	GND	Pin12	GND
Pin5	Ch3_GO/NG	Pin13	Ch7_GO/NG
Pin6	GND	Pin14	GND
Pin7	Ch4_GO/NG	Pin15	Ch8_GO/NG
Pin8	GO/NG_Enable		

Connection Type   Open collector output maximum 30VDC with 1.1V saturation voltage (100mA).

30 V DC (high)   Pass (Go) or SPEC Test: OFF

1.1 V DC (low)   Fail (NoGo)

Configuring the USB Interface

USB Interface Connection

Connection   For USB remote connection, use the USB-B
              port on the mainframe front panel.

Configuring USB Connection

Background   Of the three interface options, USB is the easiest to
              use.

USB connection   PC side connection   Type A, host

                  PEL-2000A side   Type B, device
                  connector

                  Speed   1.1/2.0(full speed)

Panel operation   1. Press the Shift Key then the Help
                     key to access the Utility menu.

                  2. Press F3 (Interface Menu).

                  05/04/22   USB
                   16 : 50   LOAD
                  Interface   UART

                  System   Load   Interface   Time Set   Other
                   Info
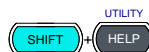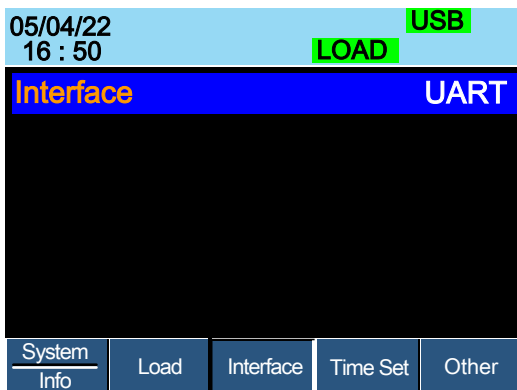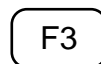
3. If the Interface mode is not USB, use the Selector knob to edit Interface.
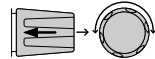
4. Choose USB.

Interface	USB

5. Press the Selector knob to confirm.
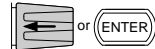
6. The Interface will become USB.

05/04/22 16 : 50	USB LOAD
Interface	USB

System Info	Load	Interface	Time Set	Other
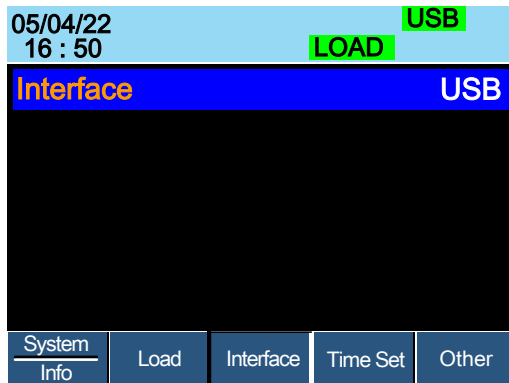
7. Connect the USB cable to the USB-B slave port on the rear.

8. When the PC asks for the USB driver, select gw_pel2k.inf (downloadable from the GW Instek website, www.gwinstek.com, PEL-2000A product corner).

USB CDC Function Check

Background	To test the UART, and USB CDC functionality, National Instruments Measurement and Automation Explorer can be used. This program is available on the NI website, www.ni.com., via a search for the VISA Run-time Engine page, or "downloads" at the following URL, http://www.ni.com/visa/
Requirements	Operating System: Windows XP, 7, 8, 10
⚠Note	Functionality check can only be performed after the cable connection has been completed and the PEL-2000A interface has been set. Users can adjust the model name to PEL-2000A or PEL-2000B.For more details about the setting, please refer to the section **Adjusting QueryModeName** on page 295.
Functionality check	1. Start the NI Measurement and Automation Explorer (MAX) program. Using Windows, press: Start>All Programs>National Instruments>Measurement & Automation 2. From the Configuration panel access, **My System>Devices and Interfaces,** select the corresponding port which is connected to PEL-2000A via USB, UART interface. 3. In this example (NI MAX Version 18.0.0f0), we assume that PEL-2000A series is connected COM 1(ASRL1), after selecting the ASRL1::INSTR "COM1", click the Open VISA Test Panel.

4. In the ASRL Settings page. You can see the information of Serial Settings.

5. Click on I/O Settings.

6. Make sure the *Enable Termination Character* check box is checked, and the terminal character is \n (Value: xA).

7. Click *Apply Changes*.

8. Click the *Input/Output* icon.

9. Enter *IDN?\n in the *Select or Enter Command* dialog box if it is not already.

10. Click the *Query* button.

11. The *IDN?\n query will return the Manufacturer, model name, serial number and firmware version in the dialog box.
GW Instek,PEL-2004A,00000001, V3.01\n

⚠Note   The COM port corresponding to the USB CDC will exist until the USB driver is well installed. If you want to do the USB CDC function check, the VISA resource name should be changed to the COM port which is occupied by the USB CDC protocol as a virtual com port in your system.

Configuring UART Interface

Configuring UART Connection

RS-232C
configuration

Connector	DB-9, Male
Baud rate	9600
Parity	None
Data bit	8
Stop bit	1

Connect the RS-232C cable (part no. GTL-232) to the rear panel port: DB-9 male connector.

RS232C

Pin assignment

1   5

6   9
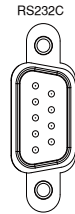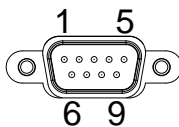
2: RxD (Receive data)

3: TxD (Transmit data)

5: GND

1, 4, 6, 7, 8, 9: No connection
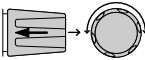
PC connection   Use the Null Modem connection as shown in the diagram below.

PEL-2000A series   PC

Pin 2 RxD — Pin 2 RxD
Pin 3 TxD — Pin 3 TxD
Pin 5 GND — Pin 5 GND
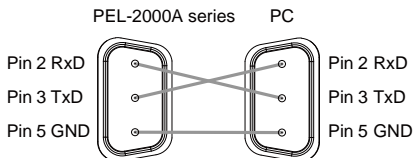
UART settings RS232

Panel operation   1.   Press the Shift Key then the Help
                       key to access the Utility menu.

> SHIFT + HELP (UTILITY)

2.   Press the Shift Key then the Help
     key to access the Utility menu.

> F3

05/04/22 16 : 50	RS232 LOAD
Interface	UART
Mode	RS232
Baud rate	38400
Data Bit	8 Bit
Parity	NONE
Stop bit	1

System Info	Load	Interface	Time Set	Other
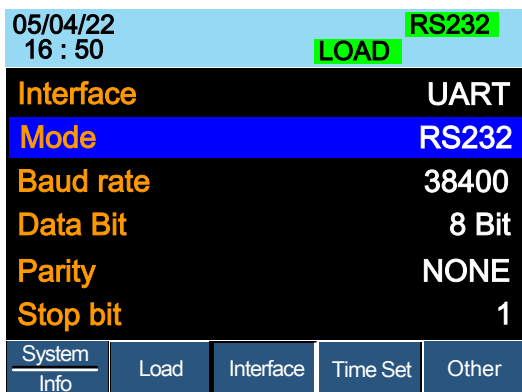
3.   If the interface is not set to RS232,
     use the selector knob to change
     the interface to RS232.

4.   Edit the Baud rate, Data Bits, Parity, Stop bits.

Mode	RS232
Baud rate	2400, 4800, 9600, 19200, 38400, 57600,115200
Data Bit	7,8
Parity	None, Odd, Even
Stop Bit	1,2

⚠ Note   When RS232 Mode is selected, the Address setting is
            not available for assignation.

UART Function Check

Background	To test the UART, and USB CDC functionality, National Instruments Measurement and Automation Explorer can be used. This program is available on the NI website, www.ni.com., via a search for the VISA Run-time Engine page, or "downloads" at the following URL, http://www.ni.com/visa/
Requirements	Operating System: Windows XP, 7, 8, 10
⚠ Note	Functionality check can only be performed after the cable connection has been completed and the PEL-2000A interface has been set. Users can adjust the model name to PEL-2000A or PEL-2000B. For more details about the setting, please refer to the section **Adjusting QueryModeName** on page 295.
Functionality check	1. Start the NI Measurement and Automation Explorer (MAX) program. Using Windows, press: Start>All Programs>National Instruments>Measurement & Automation 2. From the Configuration panel access, **My System>Devices and Interfaces,** select the corresponding port which is connected to PEL-2000A via USB, UART interface. 3. In this example (NI MAX Version 18.0.0f0), we assume that PEL-2000A series is connected COM 1(ASRL1), after selecting the ASRL1::INSTR "COM1", click the Open VISA Test Panel.

4. In the ASRL Settings page. You can see the information of Serial Settings.

5. Click on I/O Settings.

6. Make sure the *Enable Termination Character* check box is checked, and the terminal character is \n (Value: xA).

7. Click *Apply Changes*.

8. Click the *Input/Output* icon.

9. Enter *IDN?\n in the *Select or Enter Command* dialog box if it is not already.

10. Click the *Query* button.

11. The *IDN?\n query will return the Manufacturer, model name, serial number and firmware version in the dialog box.
GW Instek,PEL-2004A,00000001, V3.01\n

Configuring the GPIB Interface

Configure GPIB interface

Interface function codes | The interface function codes for the Electronic Load are listed as the following table.

Code	Interface function
SH1	Source Handshake capability
AH1	Acceptor Handshake capability
T5	Talker (basic talker, serial poll, unaddressed to talk on LAG)
L4	Listener (basic listener, unaddressed to listen on LAG)
SR1	Service Request capability
RL0	No Remote/Local capability
PP0	No Parallel Poll capability
DC1	Device Clear capability
DT0	No Device Trigger capability
C0	No Controller capability
E1	Open collector bus drivers
TE0	No Extended Talker capability
LE0	No Extended Listener capability

Connection | Connect the GPIB cable to the rear panel port: 24-pin female connector.
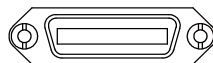
Pin assignment
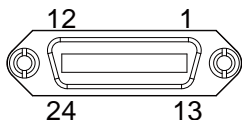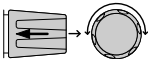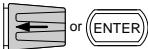
Pin1	Data line 1	Pin13	Data line 5
Pin2	Data line 2	Pin14	Data line 6
Pin3	Data line 3	Pin15	Data line 7
Pin4	Data line 4	Pin16	Data line 8
Pin5	EOI	Pin17	REN
Pin6	DAV	Pin18	Ground
Pin7	NRFD	Pin19	Ground
Pin8	NDAC	Pin20	Ground
Pin9	IFC	Pin21	Ground
Pin10	SRQ	Pin22	Ground
Pin11	ATN	Pin23	Ground
Pin12	Shield (screen)	Pin24	Signal ground

GPIB constraints
- Maximum 15 devices altogether, 20m cable length, 2m between each device
- Unique address assigned to each device
- At least 2/3 of the devices turned On
- No loop or parallel connection

Configuring the GPIB Address

Background	When using GPIB, an address must be specified.
Parameters	Address 01~30

Panel operation   1. Press the Shift Key then the Help key to access the Utility menu.

UTILITY
SHIFT + HELP

2. Press F3 (Interface Menu).

F3

```
05/04/22                          USB
 16 : 50                    LOAD
Interface                         USB



System
Info      Load    Interface   Time Set   Other
```
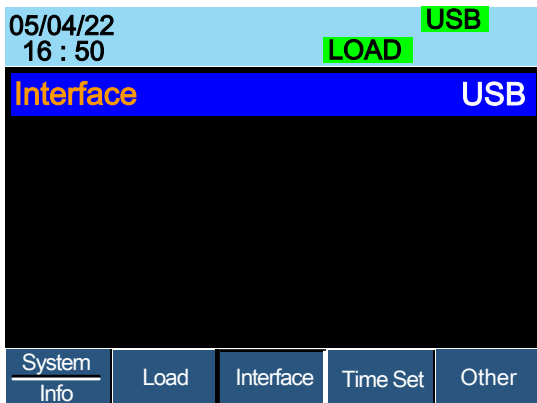
3. If the Interface mode is not GPIB, use the Selector knob to edit Interface.

4. Choose GPIB.

```
Interface                         GPIB
```

5. Press the Selector knob or Enter to confirm selection.

or ENTER

6. The GPIB menu appears.

```
05/04/22                    GPIB
 16 : 50              LOAD
Interface                   GPIB
Address                       01



System    Load   Interface  Time Set   Other
Info
```
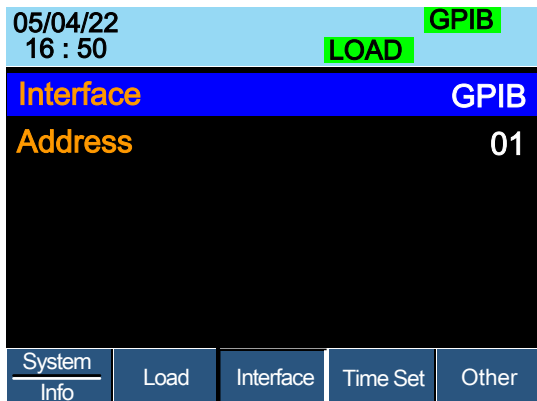
7. Use the selector knob to edit the GPIB address.
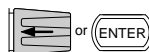
8. Edit the GPIB address.

    Range   1 ~ 30

9. Connect the GPIB cable to the rear panel port: 24-pin female connector.

GPIB constraints
- Maximum 15 devices altogether, 20m cable length, 2m between each device

- Unique address assigned to each device

- At least 2/3 of the devices turned On

- No loop or parallel connection

⚠ Note   The GPIB Address must match that of the host machine.

GPIB Function Check

Background	To test the GPIB functionality, National Instruments Measurement and Automation Explorer can be used. This program is available on the NI website, www.ni.com., via a search for the VISA Run-time Engine page, or "downloads" at the following URL, http://www.ni.com/visa/
Requirements	Operating System: Windows XP, 7, 8, 10
Functionality check	Please use the National Instruments Measurement & Automation Controller software to confirm GPIB functionality.
	See the National Instrument website, http://www.ni.com for details.
Operation	1. Start the NI Measurement and Automation Explorer (MAX) program. Using Windows, press:

       Start>All Programs>National Instruments>Measurement & Automation

2. From the Configuration panel access;

   My System>Devices and Interfaces>GPIB0

3. Press the *Scan for Instruments* button.

4. In the *Connected Instruments* panel the PEL-2000A should be detected as *Instrument 0* with the address the same as that configured on the PEL-2000A.

5. Double click the *Instrument 0* icon.
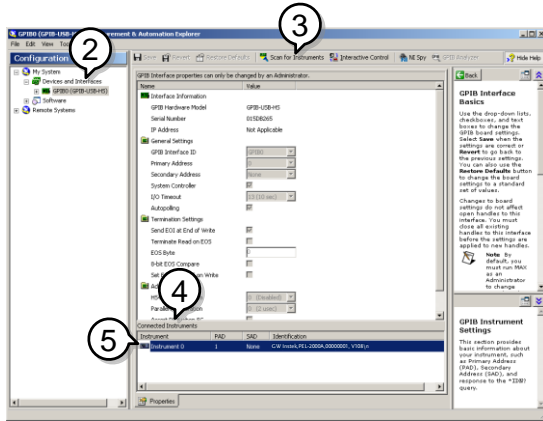
6. Click on *Communicate with Instrument*.

7. In the *NI-488.2 Communicator* window, ensure *IDN?* is written in the *Send String*: text box.

   Click on the *Query* button to send the *IDN?* query to the instrument.

8. The *String Received* text box will display the query return:

   GW Instek,PEL-2004A,00000001, V3.01\n

   (manufacturer, model, serial number, version)
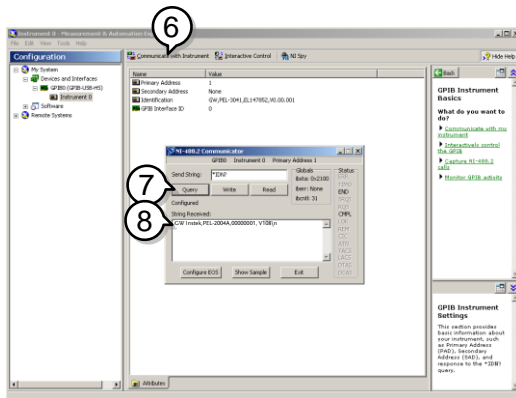
9. The function check is complete.

Configuring Ethernet Interface

Configuring Ethernet Connection

Background	When using Ethernet a number of parameters need to be set. These include DHCP On/Off, IP Address, Subnet Mask and Gateway. When setting Ethernet parameters, ensure they match that of the network.

Parameters					
	DHCP	On/Off			
	IP Address	0~255	0~255	0~255	0~255
	Subnet Mask	0~255	0~255	0~255	0~255
	Gateway	0~255	0~255	0~255	0~255

Configuration	This configuration example will configure the PEL-2000A socket server.
	The following configuration settings will manually assign the PEL-2000A an IP address and enable the socket server. The socket server port number is fixed at 2268.
Steps	1. Connect an Ethernet cable from the network to the rear panel Ethernet port. You will see the led indicator next to Ethernet port lighting.

Rear panel of PEL-2000A

2. Power on the PEL-2000A.

Panel operation   3. Press the Shift Key then the Help
key to access the Utility menu.

UTILITY

SHIFT + HELP

4. Press F3 (Interface Menu).

F3


```
05/04/22                        USB
 16 : 50              LOAD
Interface               Ethernet



   System      Load    Interface  Time Set   Other
    Info
```
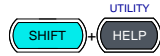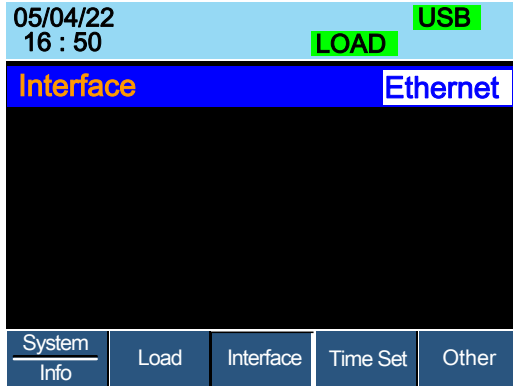
5. If the interface is not set to
Ethernet, use the selector knob
to change the interface to
Ethernet.
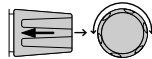
6. Choose Ethernet. Confirm that connection
status turn form Offline to Online

```
05/04/22                      Ethernet
 16 : 50           LOAD
Interface                      Ethernet
Connetion status                Offline
MAC              24-22-00-D7-BA-CB
DHCP                               ON
IP Address        172.  16.  5.  111
Subnet Mask     255. 255. 128.    0
   System      Load    Interface  Time Set   Other
    Info
```
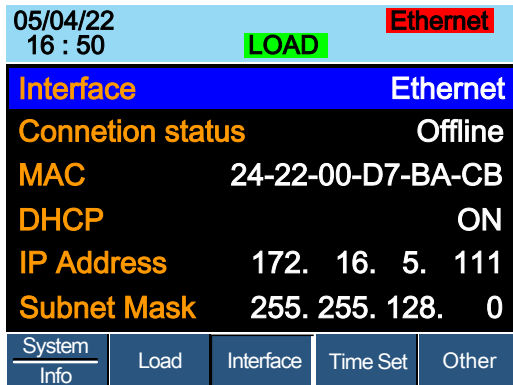
7. Check if indicator "Ethernet" turns in green and connection status becomes online status.

05/04/22 16 : 50	Ethernet LOAD
Interface	Ethernet
Connetion status	Online
MAC	24-22-00-D7-BA-CB
DHCP	ON
IP Address	172. 16. 5. 111
Subnet Mask	255. 255. 128. 0

| System Info | Load | Interface | Time Set | Other |

8. Connect the LAN RJ45 connector to the RJ45 female socket on the rear panel.

LAN
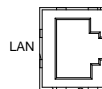
Web Server Function Check

Functionality check

The web server allows you to check the function settings of the PEL-2000A.

Enter the IP address of the PEL-2000A in a web browser.

The web browser interface appears.
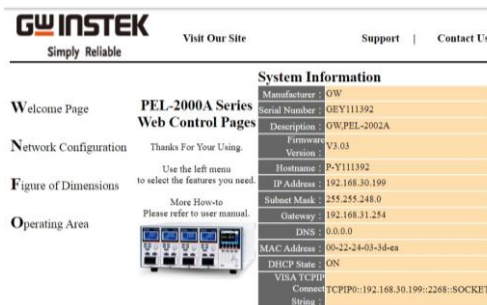
The web browser interface allows you to access the following:

- Network configuration settings
- PEL-2000A dimensions
- Operating area diagram

You can click the Network Configuration to see the configuration information.
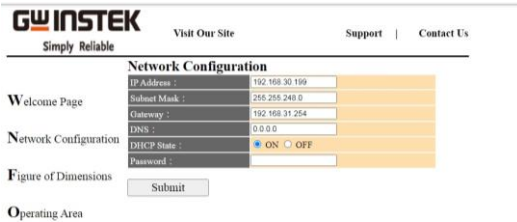
You can click the Figure of dimension to see the device dimensions information.
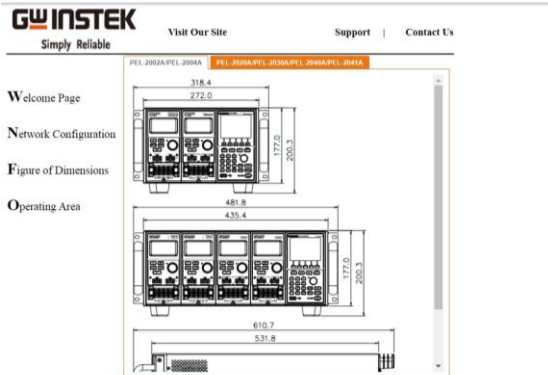
You can click the Operating area to see the Load operating area.
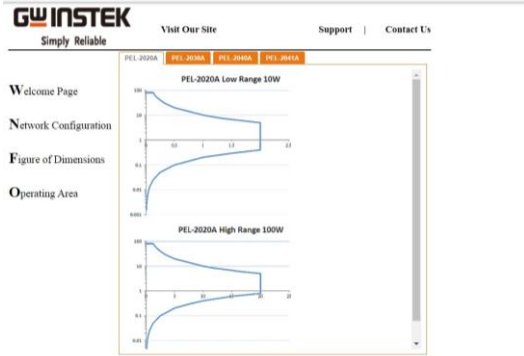
Socket Server Function Check

Background	To test the socket server functionality, National Instruments Measurement and Automation Explorer can be used. This program is available on the NI website, www.ni.com., via a search for the VISA Run-time Engine page, or "downloads" at the following URL, http://www.ni.com/visa/
Requirements	Operating System: Windows XP, 7, 8, 10
Functionality check	1. Start the NI Measurement and Automation Explorer (MAX) program. Using Windows, press:
	Start>All Programs>National Instruments>Measurement & Automation
	2. From the Configuration panel access;
	My System>Devices and Interfaces>Network Devices
	3. Press Add New Network Device>Visa TCP/IP Resource.
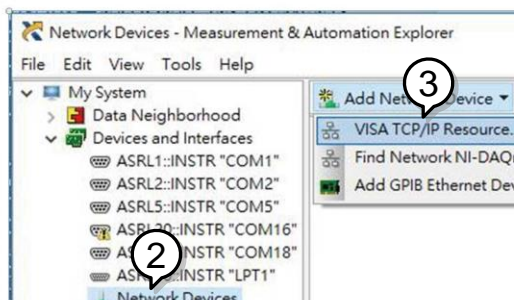
4. Select *Manual Entry of Raw Socket* from the popup window.
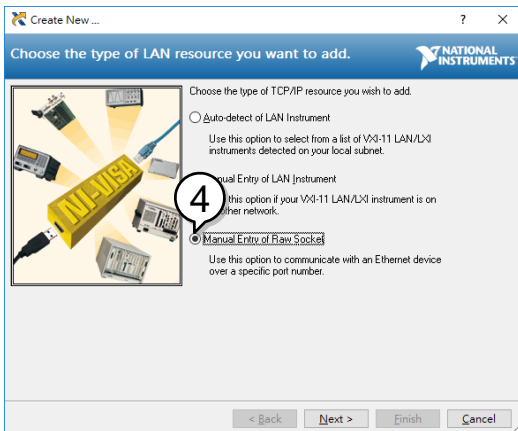
5. Enter the IP address and the port number of the PEL-2000A. The port number is fixed at 2268.

6. Click the Validate button.
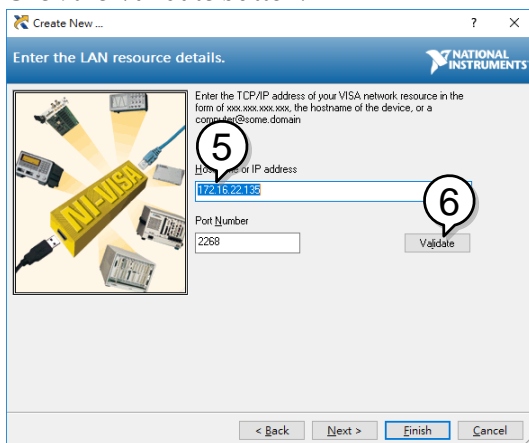
7. A popup will appear if a connection is successfully established. If not,check the Load device IP address configuare. Then click OK botton and Next botton.
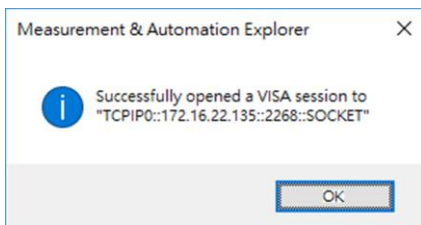
8. Click the Finish button.
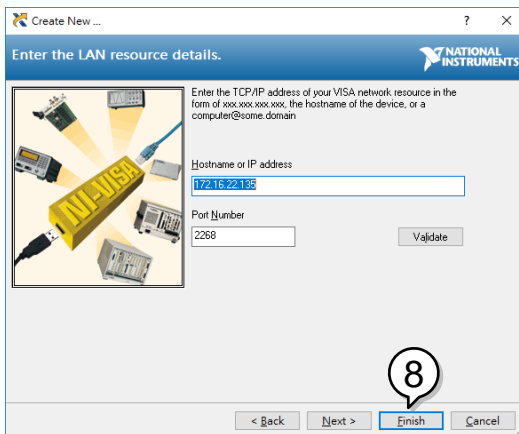
9. You can see the network device is setup successful. Click *Open VISA Test Panel*.
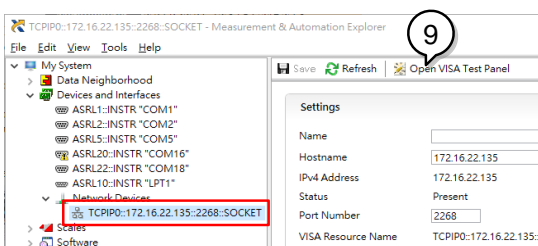
10. In the TCP/IP Settings page. You can see the information of TCP/IP.
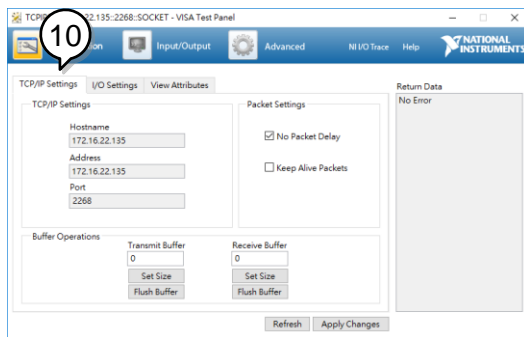
11. Click on I/O Settings.

12. Make sure the *Enable Termination Character* check box is checked, and the terminal character is \n (Value: xA).

13. Click *Apply Changes*.
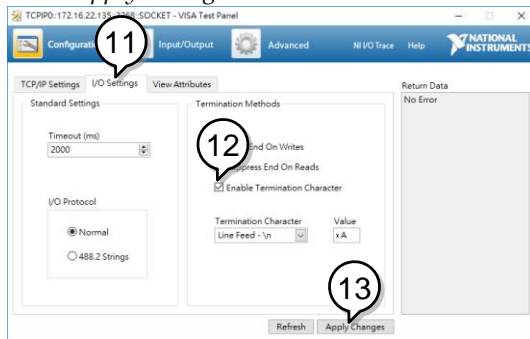
14. Click the *Input/Output* icon.

15. Enter *IDN?\n in the *Select or Enter Command* dialog box if it is not already.
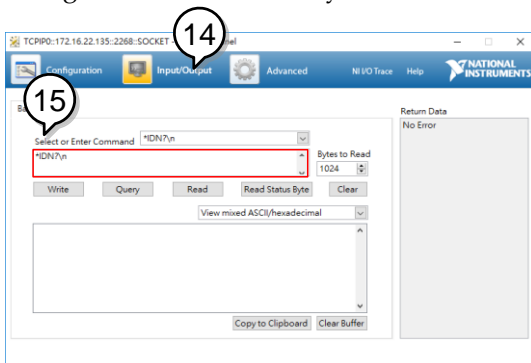
16. Click the *Query* button.

17. The *IDN?\n query will return the Manufacturer, model name, serial number and firmware version in the dialog box.
GW Instek,PEL-2004A,00000001, V3.01\n
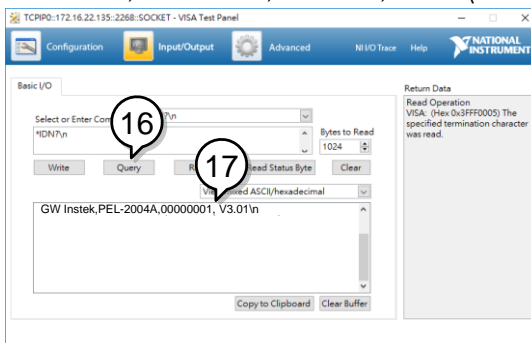
18. You can key in the command ":SYST:ERR\n"

19. Click the *Query* button. You will get the return messagn of error.
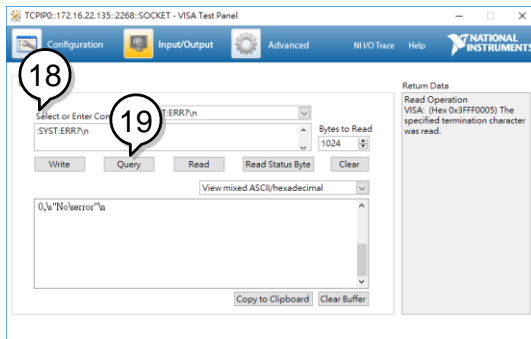
F_{AQ}

Q1. The load voltage indicated on the load module is below expected.

A1. Ensure the load leads are as short as possible, twisted and use the appropriate wire gauge. Ensure that voltage sense is used, this can help alleviate the voltage drop across the load the leads.

Q2. When I try to start a program sequence, it will not run. "No Active Channel" is displayed.

A2. Ensure the channel(s) is activated (not set to OFF) in the FUNC→Program→Active Channel menu.

Q3. When trying to save to USB, the USB memory stick is unresponsive.

A3. Try restarting the PEL-2000A mainframe. If this fails to solve the problem, ensure the USB memory is cleanly formatted.

Q4. When I try to clear an alarm, it doesn't work.

A4. Before clearing an alarm or using the Protection Clear All function, the DUT must be turned off. After the DUT is off, the alarm(s) can be cleared.

For more information, contact your local dealer or GW Instek at www.gwinstek.com

APPENDIX

Adjusting QueryModeName

Background	Users can adjust the model name to PEL-2000A or PEL-2000B

Parameter	Query Mode Name	2000A

Panel operation

1. Press the Shift Key then the Help key to access the Utility menu.

UTILITY
SHIFT + HELP

2. Press F5 (Other Menu).

F5

```
05/04/23                    Ethernet
 16 : 50              LOAD

            Other Setting
      Von Latch Clear     Auto
      Measure Period   200ms
      Jog Shuttle Control  OFF
      RVP Load Off        OFF
      QueryModeName 2000A

  System    Load    Interface  Time Set   Other
   Info
```

```
05/04/23                    Ethernet
 16 : 50              LOAD

            Other Setting
      Von Latch Clear     Auto
      Measure Period   200ms
      Jog Shuttle Control  OFF
      RVP Load Off        OFF
      QueryModeName 2000B

  System    Load    Interface  Time Set   Other
   Info
```
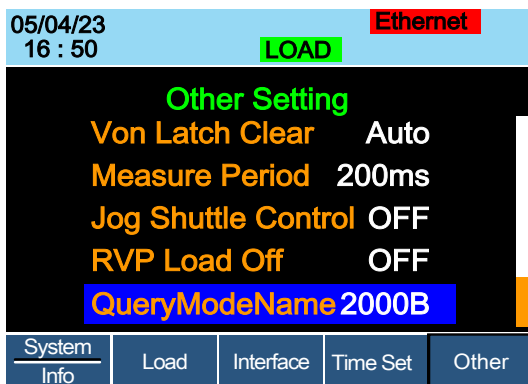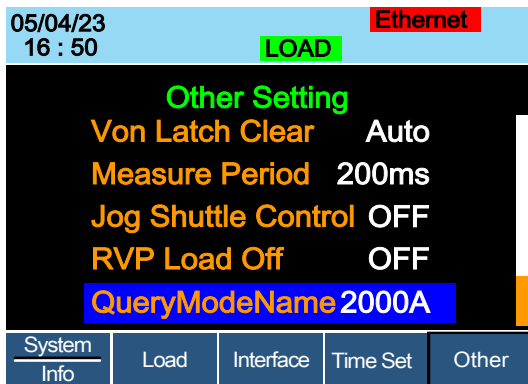
3. Use the Selector knob to highlight QueryModeName.
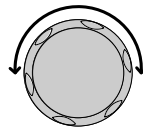
4. Press the Selector knob to edit QueryModeName, then turn to change from 2000A to 2000B and vice versa.
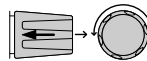
    QueryModeName 2000B

5. Press the Selector Knob or Enter to confirm selection.
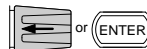
Fuse Replacement

Step

1. Turn off the power at the wall socket and rear panel. Remove the power cord.

2. Remove the fuse socket using a minus driver.
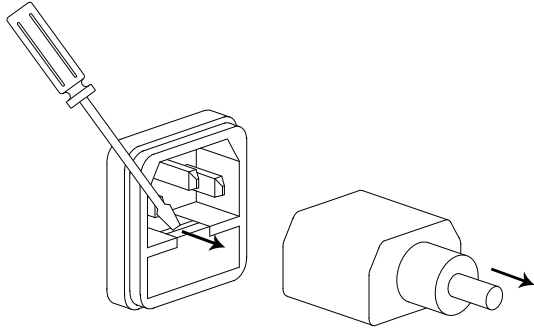
3. Replace the fuse in the holder.
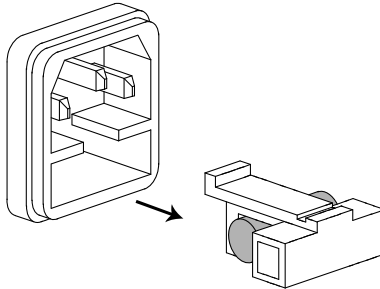
Rating   T3.15A, 250V

Firmware Update

Background	The PEL-2000A firmware can be easily updated using a USB memory stick. For the latest firmware please see your local GW Instek distributor or download the latest firmware from www.gwinstek.com.
File Name	File: P2KAXXX.UPG (V3.00 and above are XXX.UP3)
⚠Note	Copy the firmware file (*.UPG) into the root directory of a USB stick before proceeding with the firmware update.
⚠ WARNING	Do not turn the power off or remove the USB memory when the firmware is being read or upgraded.
⚠Note	If your Slave Module is PEL-2020B/ PEL-2030B/ PEL-2040B/ PEL-2041B, the mainframe (PEL-2002A/ PEL-2004A) firmware version must be V3.01.UP3 or above.
	The firmware file and upgrade procedure can be downloaded on the GWInstek website.
Panel operation	1. Insert a USB flash drive into the front panel USB slot.
	2. Press the File key.

FILE

3. Press F1 repeatedly until the Media USB menu appears.

F1

Media		Media		Media
Memory	→	USB	→	Default

4. Press F5 (File Utility).

F5
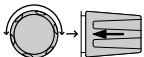
5. Use the selector knob to scroll down to the firmware file (*.UPG) and press the selector knob, Enter or F1. (V3.00 and above are XXX.UP3)

6. Press F1 to confirm the firmware upgrade.

F1
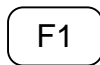
7. Wait for the firmware upgrade to finish, a message will be displayed upon completion.

8. Turn the power Off.

Recall Factory Default

9. Turn the power On.

10. Press the File key.

FILE

11. Press F1 repeatedly until the Media Default menu appears.

F1

Media Memory → Media USB → Media Default

USB
LOAD

Load Default Setup

CH2
CCH

500V
file

| Media Default | Factory Default | Save | Recall | |
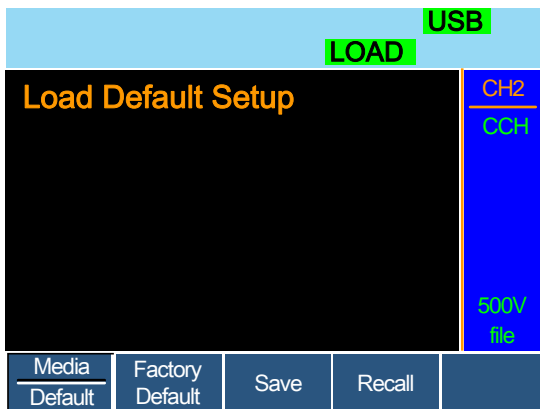
12. Press Factory Default (F2) to recall the factory default settings.

F2

13. Firmware updating process is complete and you can use the device now.

USB
LOAD

Load Default Setup

CH2
CCH

Warning! Press F2 again will Recall Factory Default!

500V
file

Media Default	Factory Default	Save	Recall	

14. Press F2 again to ensure recall factory default setting

F2

USB
LOAD

Load Default Setup

CH2
CCH

Recall Factory Default, Please Wait...

500V
file
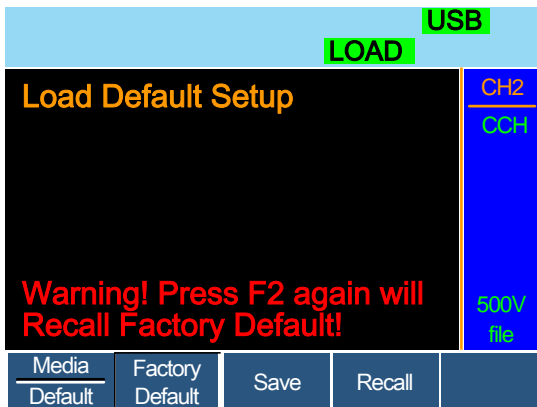
Media Default	Factory Default	Save	Recall	
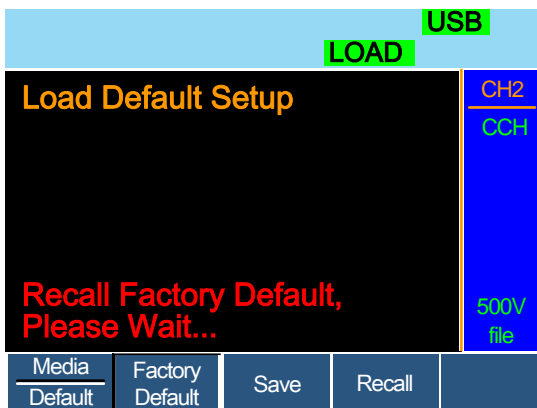
15. Wait a short time for the settings to be recalled.

Calibration

Background   The PEL-2000A(B) series load modules should be calibrated at least on a yearly basis.

For customers who need to have the service of calibration, please contact your distributor or GW instek.

Range Chart

PEL-2020A(B)
Low Range 10W
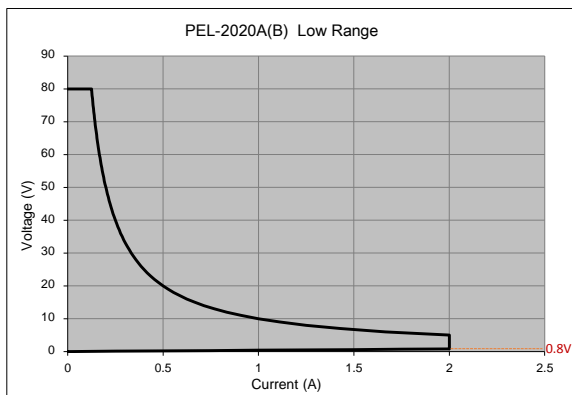
PEL-2020A(B)
High Range
100W
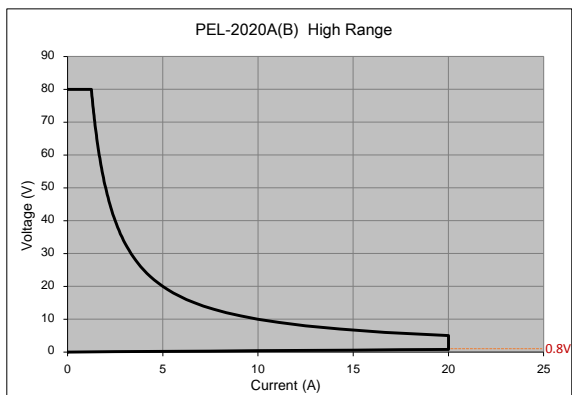
PEL-2020A(B)
CV Low Range
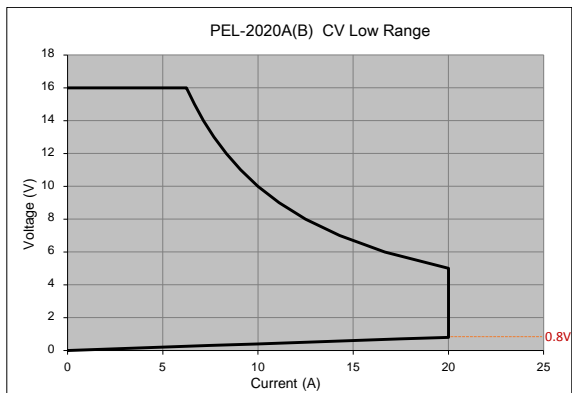
PEL-2030A(B)(L)
High range 30W

PEL-2030A(B)(L) High Range

PEL-2030A(B)(L)
CV Low Range
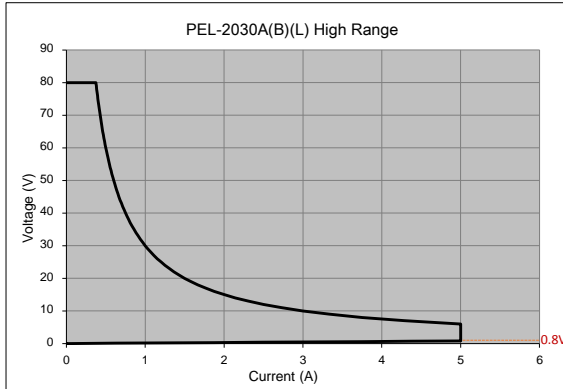
PEL-2030A(B)(L) CV Low Range
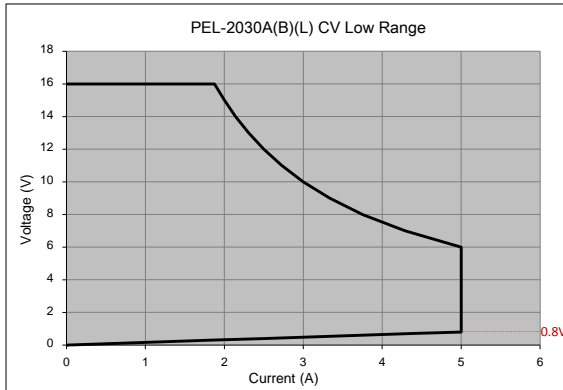
PEL-2030A(B)(R)
Low Range 25W

PEL-2030A(B)(R) Low Range
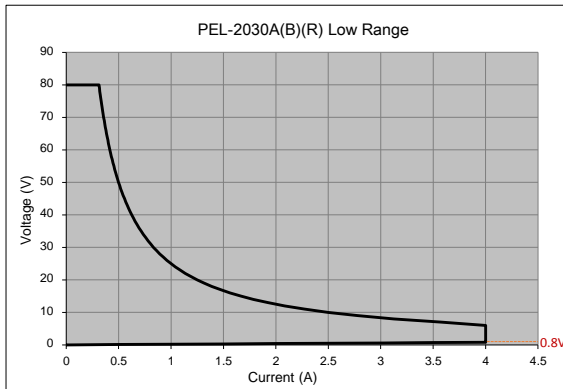
PEL-2030A(B)(R)
High Range
250W

PEL-2030A(B)(R) High Range

PEL-2030A(B)(R)
CV Low Range
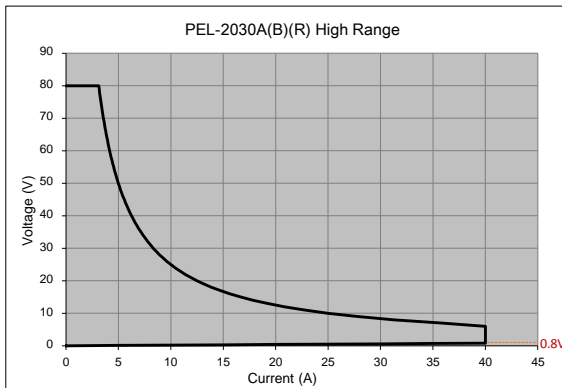
PEL-2030A(B)(R) CV Low Range
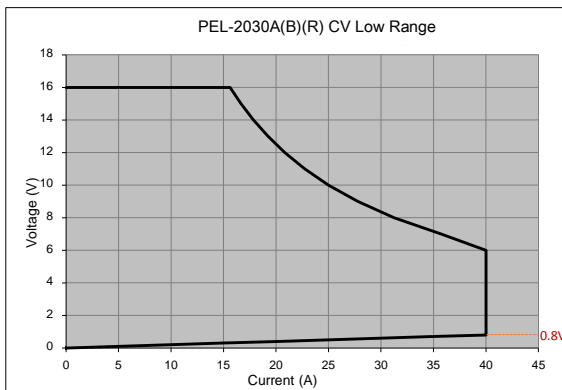
PEL-2040A(B)
Low Range 35W

PEL-2040A(B) Low Range
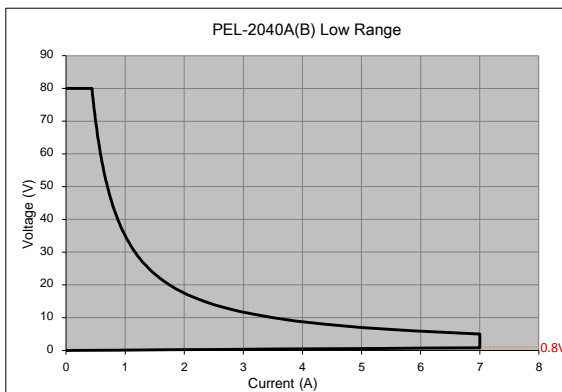
PEL-2040A(B)
High Range
350W

PEL-2040A(B) High Range

PEL-2040A(B) CV
Low Range
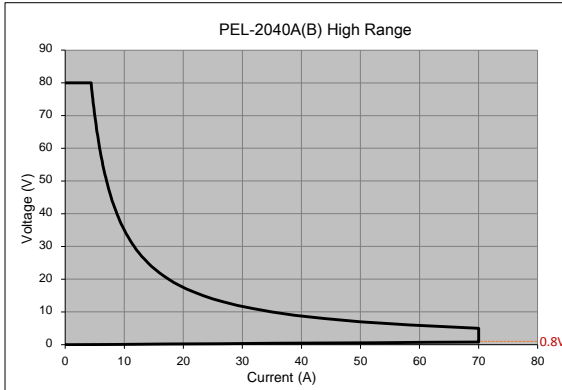
PEL-2040A(B) CV Low Range
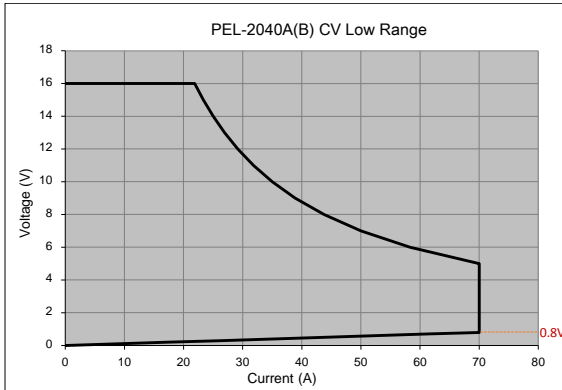
PEL-2041A(B)
Low Range 35W

PEL-2041A(B) Low Range
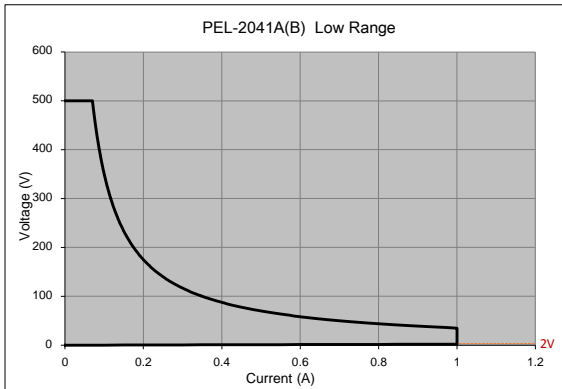
PEL-2041A(B)
High Range
350W
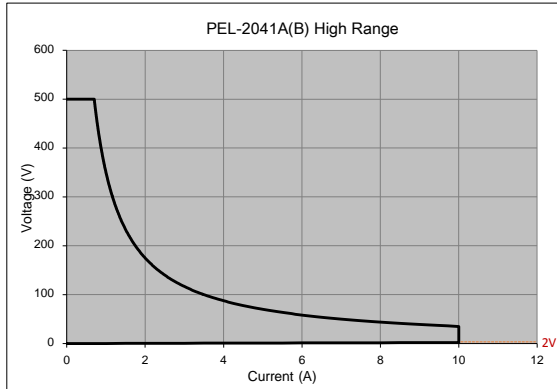
PEL-2041A(B)
CV Low Range
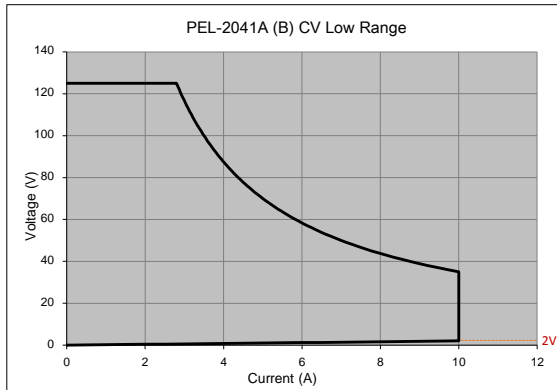
Default Settings

Menu Item		
CC Mode	Range: High	Mode: Static
	A/B Value: Min A	Rising Slew Rate: Max
	Falling Slew Rate: Max	
CR Mode	Range: High	Mode: Static
	A/B Value: Max Ω	Rising Slew Rate: Max
	Falling Slew Rate: Max	
CV Mode	Range: High	Response: Slow
	A/B Value: Max V	I Meas: High
	Curr Limit: Max A	
CP Mode	Range: High	A/B Value: Min W
	Curr Limit: Max A	
CHAN-Protection	OCP Level: Max	OCP Setting: OFF
	OVP Level: Max	OVP Setting: OFF
	OPP Level: Max	OPP Setting: OFF
	UVP Level: OFF	UVP Setting: Clear
	Protection Clear: All	
CHAN- Other	CC Vrange: High	Von Voltage: 0V
	Von Latch: OFF	CH CONT: Panel
	Independent: OFF	Load D-Time: 0.0s
	Response: Fast	CCH Step: Min
	CCL Step: Min	CRH Step: Min
	CRL Step: Min	CVH Step: Min
	CVL Step: Min	CPH Step: Min
	CPL Step: Min	Short Function: ON
	Short Key: Toggle	Short Safety: ON

CHAN-Group	Total Units: OFF	Group Mode: Para
	Display Mode: V,I	
CHAN- Seq. Edit	NO.: 001	Value: Min
	Rising/Falling SlewRate: Max	Duration Time: 0.000025s
CHAN- Seq. Edit - Loop	Repeat: Infinity Times	Start of Loop: 001 Point
	On End Of Seq.: OFF A (CC mode) OFF Ω/OFF KΩ (CR mode)	CC Vrange: High
CHAN- Go/NoGo	SPEC Test: OFF	Delay Time: 0.0 s
	Entry Mode: Value	High: Max
	Low: Min	
FUNC- Program	PROG: 01	SEQ: 01
	Memory: M001	Run: Skip
	On-Time: 0.1	Off-Time: Off
	P/F-Time: Off	Short-Time: Off
	Short Channel: All channels	
FUNC- Program Chain	Start: P01	P01~P12→: Off
FUNC- Program- Active Channel	CH 01~08: Active: OFF	Prog: Off
FUNC- Sequence	Seq.: Off	TRIG In: Off
	TRIG: CH1: OUT	TRIG: CH2~08: OFF
	Setting: CH01~CH08: OFF	
FUNC- OCP	OCP: Off	Chan: 1
	Range: High	Start C: Min
	End C: Setting Range Max	Step_C: Min
	Last_C: Min	Step_T: Min
	Delay: Min	Trig_V: Min

	Keep_T: Min	
FUNC- OCP- Active Channel	CH 01~08: Active: OFF	
FILE- Memory	Channel Data: Current Memory: M001	Data Type: Memory
FILE- USB	Channel Data: Current Save File: No File	Data Type: Memroy Recall File: No File
UTILITY- Load	Auto Load: OFF	Auto Load On: Prog
UTILITY - Interface	USB	
UTILITY - Other	Speaker: OFF Brightness: 70 Alarm (M): ON Knob Type: Updated Slave Knob: SetValue High Resolution: ON Von Latch Clear: Auto Jog Shuttle Control: OFF	Contrast: 8 Frame CONT: OFF Alarm (S): OFF Go_NoGo Tone: OFF Language: English System Mode: 0 Measure Period: 200ms RVP Load Off: OFF

Specifications

The specifications apply when the PEL-2000A series is powered on for at least 30 minutes to warm-up to a temperature of 25°C ± 5°C,

unless specified otherwise.

	PEL-2002A	PEL-2004A
MODULE SLOTS	2	4
GENERAL		
Operating Environment		
Temperature	0°C to 40°C	
Relative Humidity	0 to 85% RH	
Altitude	Up to 2000m	
Location	Indoor, no direct sunlight, dust free, almost non conductive pollution.	
Storage Environment		
Temperature	-10°C to 70°C	
Relative Humidity	< 90% RH	
Location	Indoor	
Power Supply	AC input voltage range: 100-120Vac / 200-240Vac (90-132Vac / 180-250Vac)	
	Frequency: 47~63Hz	
	Power rating: PEL-2004A: 250VA Max PEL-2002A: 150VA Max	
	Transient overvoltage on the main supply is 2500V.	
Fuse	T3.15A/250V	
Pollution degree	2	
Measurement Category	1	
Rear panel USB class	USB 2.0 full speed (CDC-ACM)	
Weight	Approx. 17.1kg (Full modules)	Approx. 28.4kg (Full modules)

PEL-2020A(B)(100Wx2)		
RANGE	Low	High
CURRENT	0~2A	0~20A
VOLTAGE	0~80V	
MIN.OPERATING	0.4V at 2A	0.8V at 20A
VOLTAGE(dc)Typ.)	0.2V at 1A	0.4V at 10A

STATIC MODE

CONSTANT CURRENT MODE

Operating Range	0~2A	0~20A
Setting Range	0~2.04A	0~20.4A
Resolution	0.1mA	1mA
Accuracy	±(0.1%set + 0.1%F.S.[*1])	±(0.1%set + 0.2%F.S).

CONSTANT RESISTANCE MODE

Operating Range	0.075Ω~300Ω(100W/16V)
	3.75Ω~15kΩ(100W/80V)
Setting Range	0.075Ω~300Ω(100W/16V)
	3.75Ω~15kΩ(100W/80V)
Resolution[*2]	0.333ms(100W/16V)
	6.667μs(100W/80V)
Accuracy[*3]	300Ω: ±(0.2%set + 0.1S)
	15kΩ: ±(0.1%set + 0.01S)

CONSTANT VOLTAGE + CONSTANT CURRENT MODE

Operating Range	1~16V	1~80V
Setting Range	0~16.32V	0~81.6V
Resolution	0.4mV	2mV
Accuracy	±(0.05%set + 0.1%F.S.)	
Current Setting Range	0~2.04A	0~20.4A
Resolution	0.1mA	1mA
Accuracy	±(0.1%set + 0.1%F.S.[*1])	±(0.1%set + 0.2%F.S.[*1])

CONSTANT POWER + CONSTANT CURRENT MODE

Operating Range	1~10W	1~100W
Setting Range	0~10.2W	0~102W
Resolution	1mW	10mW
Accuracy	±(0.5%set + 0.5%F.S.[*1])	±(0.5%set + 0.5%F.S.)
Current Setting Range	0~2.04A	0~20.4A
Resolution	0.1mA	1mA
Accuracy	±(0.1%set + 0.1%F.S.[*1])	±(0.1%set + 0.2%F.S.[*1])

NOTE : [*1] F.S. = Full scale of H Range

[*2] S (Siemens) is the unit of conductance, equal to one reciprocal ohm.

[*3] Accuracy must be calculated in conductivity units.

DYNAMIC MODE		
T1&T2	0.025ms ~ 10ms / Res: 1µs	
	10ms ~ 30s / Res: 1ms	
Accuracy	1us / 1ms ± 100ppm	
CONSTANT CURRENT MODE		
Slew Rate	0.32 ~ 80mA/µs	3.2 ~ 800mA/µs
Slew Rate Resolution	0.32mA/µs	3.2mA/µs
Slew Rate Setting Accuracy	±(10% + 15µs)	
Current Setting Range	0~2.04A	0~20.4A
Current Resolution	0.1mA	1mA
Current Accuracy	±0.4% F.S.	
CONSTANT RESISTANCE MODE		
Slew Rate	3.2 ~ 800mA/µs	
Slew Rate Resolution	3.2mA/µs	
Slew Rate Setting Accuracy	±(10% + 50µs)	
Resistance Setting Range	0.075Ω~300Ω(100W/16V)	
	3.75Ω~15kΩ(100W/80V)	
Resistance Resolution	0.333ms(100W/16V)	
	6.667µs(100W/80V)	
Resistance Accuracy	300Ω: ±(0.5%set + 0.1S)	
	15kΩ: ±(0.5%set + 0.01S)	

MEASUREMENT		
VOLTAGE READBACK		
Range	0~16V	0~80V
Resolution	0.32mV	1.6mV
Accuracy	±(0.025% read + 0.025% F.S.)	
CURRENT READBACK		
Range	0~2A	0~20A
Resolution	0.04mA	0.4mA
Accuracy	±(0.05% read + 0.05% F.S.[2])	
POWER READBACK		
Range	0~10W	0~100W
Accuracy	±(0.1% read + 0.1% F.S.[1])	
NOTE : [1] Power F.S. = Vrange F.S. x Irange F.S.		

*[2] F.S. = Full scale of H Range

PROTECTIVE	
Over Power Protection	
Range	1~102W
Resolution	0.5W
Accuracy	±(2% set + 0.25% F.S.)
Over Current Protection	
Range	0.25~20.4A
Resolution	0.05A
Accuracy	±(2% set + 0.25% F.S.)
Over Voltage Protection	
Range	1~81.6V
Resolution	0.2V
Accuracy	±(2% set + 0.25% F.S.)
Over Temperature Protection	≒85°C
Rated Power Protection (CPP)	
Value	110W
Accuracy	±5%set

GENERAL		
SHORT CIRCUIT		
Current (CC)	≒2.2/2A	≒22/20A
Voltage (CV)	≒0V	
Resistance (CR)	≒3.75Ω	≒0.075Ω
Input Resistance (Load OFF)	500kΩ(Typical)	
Temperature Coefficient	100ppm/°C	
Weight	Approx. 3.8kg	

PEL-2030A(B) (30W/250W)		
RANGE	High	Low	High
CURRENT	0~5A	0~4A	0~40A
VOLTAGE		0~80V	
MIN.OPERATING VOLTAGE (dc)	0.8V at 5A 0.4V at 2.5A	0.4V at 4A 0.2V at 2A	0.8V at 40A 0.4V at 20A

STATIC MODE		
CONSTANT CURRENT MODE		
Operating Range	0~5A	0~4A	0~40A
Setting Range	0~5.1A	0~4.08A	0~40.8A

Resolution	0.125mA	0.1mA	1mA
Accuracy	±(0.1%set + 0.1%F.S.)	±(0.1%set + 0.1%F.S.[*1])	±(0.1%set + 0.2%F.S.)

CONSTANT RESISTANCE MODE

Operating Range	0.3Ω ~1.2kΩ (30W/16V) 15Ω ~60kΩ (30W/80V)	0.0375Ω ~150Ω(250W/16V) 1.875Ω ~7.5kΩ(250W/80V)	
Setting Range	0.3Ω~1.2kΩ (30W/16V) 15Ω~60kΩ (30W/80V)	0.0375Ω ~150Ω(250W/16V) 1.875Ω ~7.5kΩ(250W/80V)	
Resolution[*2]	83.333μs (30W/16V) 1.666μs (30W/80V)	0.666ms(250W/16V) 13.333μs(250W/80V)	
Accuracy[*3]	1.2kΩ: ± (0.2%set + 0.1S) 60kΩ: ± (0.1%set + 0.01S)	150Ω: ±(0.2%set + 0.1S) 7.5kΩ: ±(0.1%set + 0.01S)	

CONSTANT VOLTAGE + CONSTANT CURRENT MODE

Operating Range	1~16V	1~80V	1~16V	1~80V
Setting Range	0~16.32V	0~81.6V	0~16.32V	0~81.6V
Resolution	0.4mV	2mV	0.4mV	2mV
Accuracy	±(0.05%set + 0.1%F.S.)		±(0.05%set + 0.1%F.S.)	
Current Setting Range	0~5.1A		0~4.08A	0~40.8A
Resolution	0.125mA		0.1mA	1mA
Accuracy	±(0.1%set + 0.2%F.S.)		±(0.1%set + 0.1%F.S.[*1])	±(0.1%set + 0.2%F.S.[*1])

CONSTANT POWER + CONSTANT CURRENT MODE

Operating Range	1~30W	1~25W	1~250W
Setting Range	0~30.6W	0~25.5W	0~255W
Resolution	1mV	1mV	10mV
Accuracy	±(0.5%set + 0.5%F.S.)	±(0.5%set + 0.5%F.S.[*1])	
Current Setting Range	0~5.1A	0~4.08A	0~40.8A
Resolution	0.125mA	0.1mA	1mA

Accuracy	±(0.1%set + 0.2%F.S.)	±(0.1%set + 0.1%F.S.[1])	±(0.1%set + 0.2%F.S.[1])

NOTE : [1] F.S. = Full scale of H Range

[2] S (Siemens) is the unit of conductance, equal to one reciprocal ohm.

[3] Accuracy must be calculated in conductivity units.

DYNAMIC MODE			
T1&T2	0.025ms ~ 10ms / Res: 1μs		
	10ms ~ 30s / Res: 1ms		
Accuracy	1us / 1ms + 100ppm		

CONSTANT CURRENT MODE

Slew Rate	0.8 ~ 200mA/μs	0.64 ~160mA/μs	6.4 ~ 1600mA/μs
Slew Rate Resolution	0.8mA/μs	0.64mA/μs	6.4mA/μs
Slew Rate setting Accuracy	±(10% + 15μs)		
Current Setting Range	0~5.1A	0~4.08A	0~40.8A
Current Resolution	0.125mA	0.1mA	1mA
Current Accuracy	±0.4% F.S.		

CONSTANT RESISTANCE MODE

Slew Rate	0.8 ~ 200mA/μs	6.4 ~ 1600mA/μs
Slew Rate Resolution	0.8mA/μs	6.4mA/μs
Slew Rate Setting Accuracy	±(10% + 50μs)	
Resistance Setting Range	0.3Ω~1.2kΩ (30W/16V) 15Ω~60kΩ (30W/80V)	0.0375Ω ~150Ω(250W/16V) 1.875Ω ~7.5kΩ(250W/80V)
Resistance Resolution	83.333μs (30W/16V) 1.666μs (30W/80V)	0.666ms(250W/16V) 13.333μs(250W/80V)
Resistance Accuracy	1.2kΩ: ±(0.5%set + 0.1S) 60kΩ: ±(0.5%set + 0.01S)	150Ω: ±(0.5%set + 0.1S) 7.5kΩ: ±(0.5%set + 0.01S)

MEASUREMENT

VOLTAGE READBACK

Range	0~16V	0~80V	0~16V	0~80V
Resolution	0.32mV	1.6mV	0.32mV	1.6mV
Accuracy	±(0.025% read + 0.025% F.S.)			

CURRENT READBACK

Range	0~5A	0~4A	0~40A
Resolution	0.1mA	0.08mA	0.8mA
Accuracy	±(0.05% read + 0.05% F.S.[2])		

POWER READBACK

Range	0~30W	0~25W	0~250W
Accuracy	±(0.1% read + 0.1% F.S.[1])	±(0.1% read + 0.1% F.S.[1])	

NOTE : [1] Power F.S. = Vrange F.S. x Irange F.S.
[2] F.S. = Full scale of H Range

PROTECTIVE

Over Power Protection

Range	0.9~30.6W	1.25~255W
Resolution	0.15W	1.25W
Accuracy	±(2%set + 0.25%F.S.)	

Over Current Protection

Range	0.0625~5.1A	0.5~40.8A
Resolution	0.0125A	0.1A
Accuracy	±(2%set + 0.25%F.S.)	

Over Voltage Protection

Range	1~81.6V
Resolution	0.2V
Accuracy	±(2%set + 0.25%F.S.)
Over Temperature Protection	≒85°C

Rated Power Protection(CPP)

Value	33W	275W
Accuracy	±5%set	

GENERAL

SHORT CIRCUIT

Current(CC)	≒5.5/5A	≒4.4/4A	≒44/40A
Voltage(CV)	≒0V		
Resistance(CR)	≒15Ω ≒0.3Ω	≒1.875Ω	≒0.0375Ω

Input Resistance (Load OFF)   500kΩ(Typical)

Temperature Coefficient	100ppm/°C			
Weight	Approx. 3.8kg			

	PEL-2040A(B)		PEL-2041A(B)	
RANGE	Low	High	Low	High
CURRENT	0~7A	0~70A	0~1A	0~10A
VOLTAGE	0~80V		0~500V	
MIN.OPERATING VOLTAGE(dc)Typ.)	0.4V at 7A	0.8V at 70A	1V at 1A	2V at 10A
	0.2V at 3.5A	0.4V at 35A	0.5V at 0.5A	1V at 5A

STATIC MODE

CONSTANT CURRENT MODE

Operating Range	0~7A	0~70A	0~1A	0~10A
Setting Range	0~7.14A	0~71.4A	0~1.02A	0~10.2A
Resolution	0.2mA	2mA	0.05mA	0.5mA
Accuracy	±(0.1%set + 0.1%F.S.[*1])	±(0.1%set + 0.2%F.S.)	±(0.1%set + 0.1%F.S.[*1])	±(0.1%set + 0.2%F.S.)

CONSTANT RESISTANCE MODE

Operating Range	0.025Ω~100Ω(350W/16V) 1.25Ω~5kΩ(350W/80V)	1.25Ω~5kΩ(350W/125V) 50Ω~200kΩ(350W/500V)
Setting Range	0.025Ω~100Ω(350W/16V) 1.25Ω~5kΩ(350W/80V)	1.25Ω~5kΩ(350W/125V) 50Ω~200kΩ(350W/500V)
Resolution[*2]	1mS(350W/16V) 20μS(350W/80V)	20μS(350W/125V) 0.5μS(350W/500V)
Accuracy[*3]	100Ω: ±(0.2%set + 0.1S) 5kΩ: ±(0.1%set + 0.01S)	5kΩ: ±(0.2%set + 0.02S) 200kΩ: ±(0.1%set + 0.005S)

CONSTANT VOLTAGE + CONSTANT CURRENT MODE

Operating Range	1~16V	1~80V	2.5~125V	2.5~500V
Setting Range	0~16.32V	0~81.6V	0~127.5V	0~510V
Resolution	0.4mV	2mV	2.5mV	10mV
Accuracy	±(0.05%set + 0.1%F.S.)		±(0.05%set + 0.1%F.S.)	
Current Setting Range	0~7.14A	0~71.4A	0~1.02A	0~10.2A
Resolution	0.2mA	2mA	0.05mA	0.5mA
Accuracy	±(0.1%set + 0.1%F.S.[*1])	±(0.1%set + 0.2%F.S.[*1])	±(0.1%set + 0.1%F.S.[*1])	±(0.1%set + 0.2%F.S.[*1])

CONSTANT POWER + CONSTANT CURRENT MODE

Operating Range	1~35W	1~350W	1~35W	1~350W
Setting Range	0~35.7W	0~357W	0~35.7W	0~357W

Resolution	1mW	10mW	1mW	10mW
Accuracy	±(0.5%set + 0.5%F.S.[1])	±(0.5%set + 0.5%F.S.)	±(0.5%set + 0.2%F.S.[1])	±(0.5%set + 0.5%F.S.)
Current Setting Range	0~7.14A	0~71.4A	0~1.02A	0~10.2A
Resolution	0.2mA	2mA	0.05mA	0.5mA
Accuracy	±(0.1%set + 0.1%F.S.[1])	±(0.1%set + 0.2%F.S.[1])	±(0.1%set + 0.1%F.S.[1])	±(0.1%set + 0.2%F.S.[1])

NOTE : [1] F.S. = Full scale of H Range

    [2] S (Siemens) is the unit of conductance, equal to one reciprocal ohm.

    [3] Accuracy must be calculated in conductivity units.

DYNAMIC MODE				
T1&T2	0.025ms~10ms/Res: 1µs			
	10ms ~ 30s / Res: 1ms			
Accuracy	1us / 1ms ± 100ppm			

CONSTANT CURRENT MODE				
Slew Rate	0.001 ~ 0.28A/µs	0.01 ~ 2.8A/µs	0.16 ~ 40mA/µs	1.6 ~ 400mA/µs
Slew Rate Resolution	0.001A/µs	0.01A/µs	0.16mA/µs	1.6mA/µs
Slew Rate Setting Accuracy	±(10% + 15us)			
Current Setting Range	0~7.14A	0~71.4A	0~1.02A	0~10.2A
Current Resolution	0.2mA	2mA	0.05mA	0.5mA
Current Accuracy	±0.4% F.S.		±0.4% F.S.	

CONSTANT RESISTANCE MODE		
Slew Rate	0.01 ~ 2.8A/µs	1.6 ~ 400mA/µs
Slew Rate Resolution	0.01A/µs	1.6mA/µs
Slew Rate Setting Accuracy	±(10% + 50µs)	
Resistance Setting Range	0.025Ω~100Ω(350W/16V) 1.25Ω~5kΩ(350W/80V)	1.25Ω~5kΩ(350W/125V) 50Ω~200kΩ(350W/500V)
Resistance Resolution	1ms(350W/16V) 20µSs(350W/80V)	20µs(350W/125V) 0.5µs(350W/500V)
Resistance Accuracy	100Ω: ±(0.5%set + 0.1S) 5kΩ: ±(0.5%set + 0.01S)	5KΩ: ±(0.5%set + 0.02S) 200kΩ: ±(0.5%set + 0.005S)

MEASUREMENT

VOLTAGE READBACK

Range	0~16V	0~80V	0~125V	0~500V
Resolution	0.32mV	1.6mV	2.5mV	10mV
Accuracy	±(0.025% read + 0.025% F.S.)			

CURRENT READBACK

Range	0~7A	0~70A	0~1A	0~10A
Resolution	0.14mA	1.4mA	0.02mA	0.2mA
Accuracy	±(0.05% read + 0.05% F.S.[*2])			

POWER READBACK

Range	0~35W	0~350W	0~35W	0~350W
Accuracy	±(0.1% read + 0.1% F.S.[*1])			

NOTE : [*1] Power F.S. = Vrange F.S. x Irange F.S.

[*2] F.S. = Full scale of H Range

PROTECTIVE

Over Power Protection

Range	1.75~357W
Resolution	1.75W
Accuracy	±(2%set + 0.25%F.S.)

Over Current Protection

Range	0.875~71.4A	0.125~10.2A
Resolution	0.175A	0.025A
Accuracy	±(2%set + 0.25%F.S.)	

Over Voltage Protection

Range	1~81.6V	2.5~510V
Resolution	0.2V	1.25V
Accuracy	±(2%set + 0.25%F.S.)	

Over Temperature Protection	≒85°C

Rated Power Protection(CPP)

Value	385W
Accuracy	±5%set

GENERAL

SHORT CIRCUIT

Current(CC)	≒7.7/7A	≒77/70A	≒1.1/1A	≒11/10A
Voltage(CV)	≒0V			
Resistance(CR)	≒1.25Ω	≒0.025Ω	≒50Ω	≒1.25Ω

Input Resistance (Load OFF)	500kΩ(Typical)
Temperature Coefficient	100ppm/°C
Weight	Approx. 3.8kg

⚠️Note   If your Slave Module is PEL-2020B/ PEL-2030B/ PEL-2040B/ PEL-2041B, the mainframe (PEL-2002A/ PEL-2004A) firmware version must be V3.01.UP3 or above.

The firmware file and upgrade procedure can be downloaded on the GWInstek website.

Dimensions

PEL-2002A
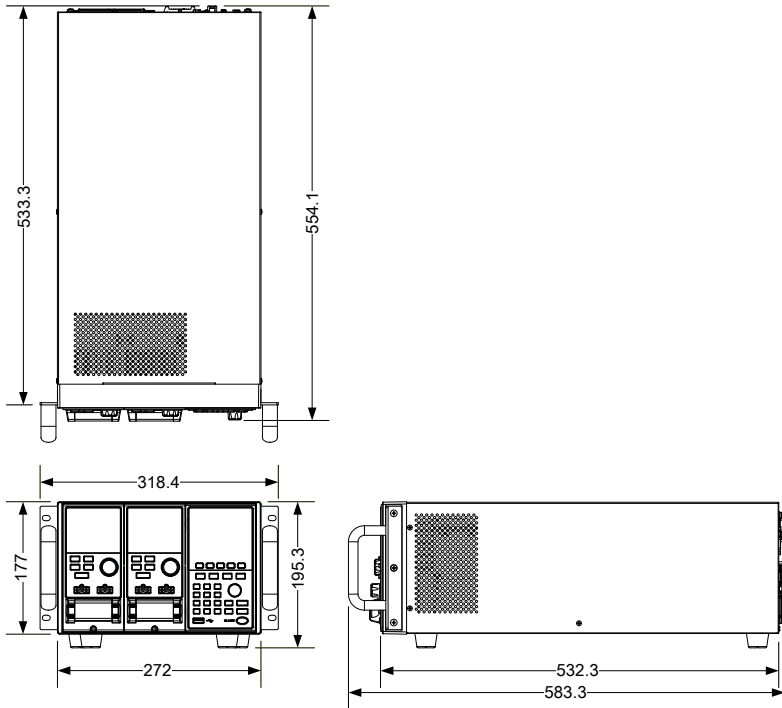
PEL-2004A

PEL-2020A(B)/ PEL-2030A(B)/ PEL-2040A(B)/ PEL-2041A(B)

475

446.8

171.2

81.6
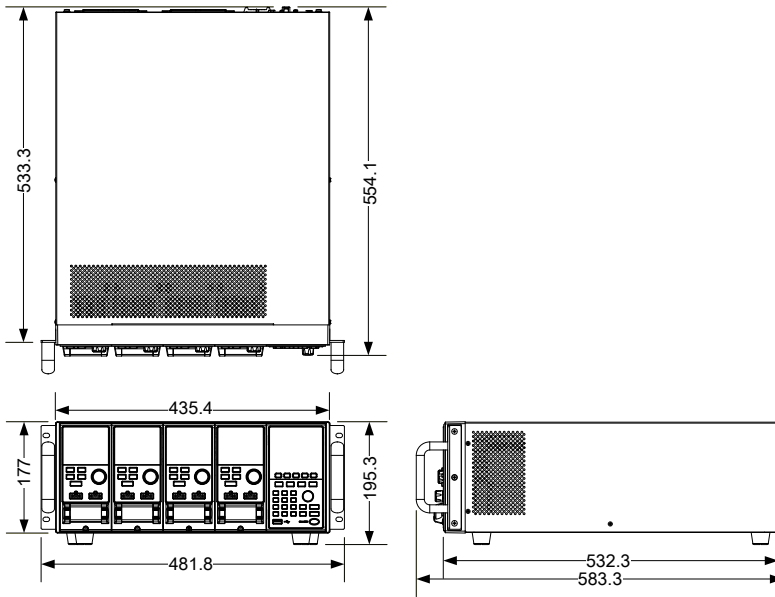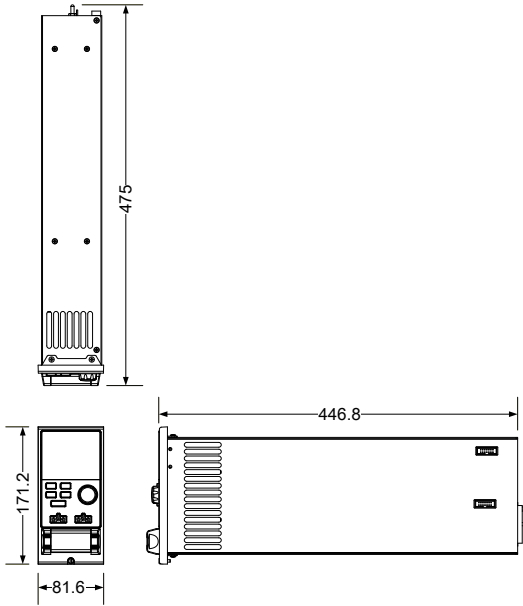
Certificate Of Compliance

We

GOOD WILL INSTRUMENT CO., LTD.

declare that the CE marking mentioned product

satisfies all the technical relations application to the product within the scope of council:

Directive: EMC; LVD; WEEE; RoHS

The product is in conformity with the following standards or other normative documents:

◎ EMC	
EN 61326-1	Electrical equipment for measurement, control and laboratory use –– EMC requirements
Conducted & Radiated Emission EN 55011 / EN 55032	Electrical Fast Transients EN 61000-4-4
Current Harmonics EN 61000-3-2 / EN 61000-3-12	Surge Immunity EN 61000-4-5
Voltage Fluctuations EN 61000-3-3 / EN 61000-3-11	Conducted Susceptibility EN 61000-4-6
Electrostatic Discharge EN 61000-4-2	Power Frequency Magnetic Field EN 61000-4-8
Radiated Immunity EN 61000-4-3	Voltage Dip/ Interruption EN 61000-4-11 / EN 61000-4-34
◎ Safety	
EN 61010-1 :	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

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