



**Innovative Circuit
Technology Ltd.**



Pro Series DC Power Supply

INSTRUCTION MANUAL

855-343-001

Models:

ICT690-12S/ICT690-12SB

ICT690-24S/ICT690-24SB

ICT690-48S/ICT690-48SB

ICT1190-12S/ICT1190-12SB

ICT1190-24S/ICT1190-24SB

ICT1190-48S/ICT1190-48SB

 **WARNING**

Risk of serious personal injury or damage to equipment and property! Always observe the following:

- Install and operate unit in a Restricted Access location, such as an enclosed equipment rack
- Operate the supply from a grounded 3-pin 120Vac or 230Vac outlet (50 or 60Hz) with a branch circuit breaker rated 20A or less

Always observe the following for applications requiring a back up battery:

- Use only a Lead-Acid battery with rating and capacity appropriate for the model of supply in use
- Use an appropriate dc over-current protection device in line with the back-up battery connection
- Use a disconnect switch or circuit breaker in series with the battery connection, to ensure installation and service is done with the battery de-energised
- Use wire and connectors rated for the maximum load current and size of battery fuse or circuit breaker
- Ensure battery polarity is correct before connecting
- Do not attempt to charge a frozen battery
- Handle batteries with care, never short circuit battery terminals

 **CAUTION**

Risk of personal injury or damage to equipment! Always observe the following:

- Install in a protected environment, keep sources of moisture away from unit
- Ensure the total power consumption of the load does not exceed the continuous rated capacity of the power supply output
- Do not block air inlet or outlet openings in the unit
- Do not place the power supply directly above or below an exposed battery, due to possible presence of corrosive and/or flammable gasses
- Do not add a ground connection to both battery and load, as this will bypass the internal LVD relay

Rev 1.2
2018

Copyright © 2018 Innovative Circuit Technology Ltd. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written consent of Innovative Circuit Technology Ltd.

Table of Contents

- INTRODUCTION 4
- CHECK and CONFIGURE UNIT 4
- INSTALLATION 6
- OPERATION..... 7
 - Status Indicators and Alarms 9
- PRODUCT SPECIFICATIONS..... 10
- LIMITED WARRANTY..... 12

INTRODUCTION

Pro Series power supplies from ICT provide a reliable 690 or 1200 Watts of rack-mountable dc power with optional built-in battery back-up support and a low voltage disconnect (LVD, option “B”) to power 12, 24, or 48Vdc based systems. With an efficient wide range power factor corrected input the units are useable world-wide, and their built in rack mounting ears and bus-bar outputs make installation simple.

- Wide range Power Factor corrected AC input supports operation world wide
- Dedicated independently controlled backup battery port with LVD relay (units with LVD option “B”)
- Selectable charge rates to accommodate lower capacity batteries (units with LVD option “B”)
- Remote on/off control input for external control of the output
- Floating Form-C alarm contact output supports remote monitoring of unit operation

Model ¹	Output Voltage (V)	Max Output Current (A)	Continuous Current (A)
ICT690-12S(B)	13.8	50	50
ICT690-24S(B)	27.6	25	25
ICT690-48S(B)	55.2	12.5	12.5
ICT1190-12S(B)	13.8	100	87
ICT1190-24S(B)	27.6	50	44
ICT1190-48S(B)	55.2	25	22

CHECK and CONFIGURE UNIT

Perform a quick physical check of the unit as it is being taken out of the box to ensure it has not been damaged during shipping. Check for the included parts and accessories shipped with your unit:

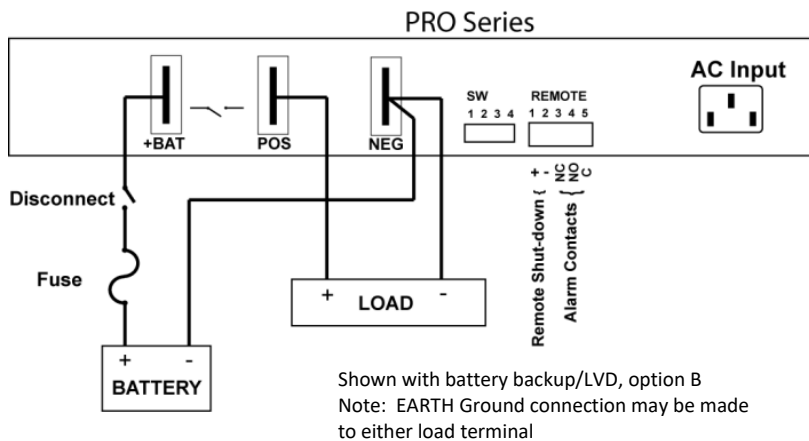
- 5 pin Form-C alarm/remote connector plug (installed on unit)
- Power cord (North America 120V 15A)
- 2 (3 for “B” units) ¼-20 Hex bolt, washer, nut sets for bus bar connections
- Output connector shield (installed over output bus bars)
- Instruction Manual

¹ Model suffix “B” denotes units equipped with the optional LVD Battery port

WARNING

Risk of serious personal injury or damage to equipment and property! Always observe the following!

- If a battery is used ensure the nominal battery voltage is correct for the model of power supply, and that the battery positive is connected to the BAT positive (+) terminal and the battery negative is connected to the NEG (-) terminal.
- Use an appropriate dc over-current protection device such as a fuse or circuit breaker in line with the battery connection
- Do not tie the POS and +BAT terminals together, as this will bypass the internal LVD circuitry
- Make any earth Ground connection to only a single LOAD or BAT terminal if required. Do not ground both the load and battery as this may bypass the internal LVD circuitry
- AC input wiring to the Pro Series unit must be protected using an outlet with a branch rated circuit breaker of 20A or lower value



Connection Diagram (Showing Rear Connectors and SW Switch 1-4)

Configure the Output Settings:

Always switch off the unit before changing the settings or making connections.

- Choose a lead-acid battery with a nominal voltage rating (12/24/48V) that matches the Pro Series rated output. Note that for good battery life the battery should have a combined Ahr capacity of at least 3 times the maximum charge current being used. (e.g. Use a 75Ahr or larger rated battery (3 x 25A) with a 25A max charge setting)
- Set the max charge current to be supplied to the battery by setting SW 3, and SW 4 on the back panel according to the following chart: (note that actual current flow to the battery may be less than the setting, and is determined by the battery state of charge and temperature)

Max Charge (% of Output)	Max Charge (100A Models)	Max Charge (50A Models)	Max Charge (25A Models)	Max Charge (12A Models)	BAT SW3 Setting	BAT SW4 Setting
100% (Default)	100A	50A	25A	12.5A	1	1
75%	75A	38A	19A	9.4A	1	0
50%	50A	25A	12.5A	6.3A	0	1
25%	25A	12.5A	6.3A	3.1A	0	0

Maximum Charge Current – Switch Settings (1 = UP, 0 = Down)

- Set the low voltage disconnect (LVD) disconnect and reconnect voltage points, by setting SW 1, and SW 2 on the back panel according to the following chart:

LVD Setting	12V	24V	48V	BAT SW1 Setting	BAT SW2 Setting
Disconnect V (Default)	11.5	23	46	x	1
Disconnect V (low setting)	10.5	21	42	x	0
Reconnect V (Default)	12.5	25	50	1	x
Reconnect V (low setting)	12	24	48	0	x

LVD Disconnect/Reconnect V – Switch Settings (1 = UP, 0 = Down, x = either)

INSTALLATION

Mount the unit in a standard 19 inch equipment rack, (ensuring side air vents are not blocked) using rack mounting screws (not supplied), then make the following connections using wire and connectors appropriately rated for the maximum input and output current rating of the unit:

- Remove the plastic bus bar cover by removing the two screws holding it in place
- Connect the supply POS output bus bar to the load positive input (using a supplied bus bar bolt/washer/nut set for the bus bar connection) (NOTE: do not connect the load directly to the battery, as this will defeat the battery charging and low voltage disconnect functions)
- Connect the supply NEG bus bar to the load negative input terminal (using a supplied bus bar bolt/washer/nut set for the bus bar connection)
- Connect a ground bonding wire from the chassis ground stud to the rack

- On units with the optional battery back-up and LVD capability (model suffix “B”):
 - Choose a lead-acid battery with a float voltage rating that matches the Pro Series output voltage, and has an Amp-hour (Ahr) capacity rating greater than 3 times the max charge current setting of the power supply (i.e. use a 75Ahr battery or larger on a 25A charge setting)
 - Connect the battery negative to the supply NEG bus bar
 - Connect the battery positive to an over current protection device (fuse or breaker) and disconnect switch
 - With the battery fuse removed or disconnect switch open connect the fuse or switch to the supply BAT(+) terminal
 - Either the POS or NEG load lead may be connected to earth ground if required, but the internal LVD contactor is always connected to the battery positive, as shown. NOTE: Do not ground the battery POS terminal, as this may bypass the internal LVD relay

- Connect the remote on-off control or unit form-C alarm contact monitoring wiring to the REMOTE connector if needed, as shown in the following table:

Pin Number	Name	Function
1	Shutdown (+)	Remote output shutdown, positive (2.5-16Vdc)
2	Shutdown (-)	Remote output shutdown, return
3	NC	Alarm NC (alarm state)
4	NO	Alarm NO (alarm state)
5	Common	Alarm output common

REMOTE Connector: (use 22-26AWG wire)

Check that all connections to the power supply are correct and tight; re-install the plastic bus bar cover using the original two screws provided.

Connect the AC power cord: Plug an approved AC power cord set rated for 15A (120V) or 10A (230V) into the IEC type AC input connector on the back panel of the supply (120V cord included with unit), then plug into a grounded 3 terminal 120Vac or 230Vac power outlet, with the front panel switch in the off position.

OPERATION

Switch on the unit using the front panel power switch, and observe that the front panel green POWER LED is lit. Verify the supply output voltage using a hand held digital voltmeter. If a battery is connected install the external fuse and close the disconnect switch.

On units with the battery back-up option connected switch off the ac power, and use a hand held digital voltmeter to verify that the battery voltage is provided to the output load terminal. Switch AC power back on, and verify the output supply voltage rises to the normal output rating as the battery charges.

The unit can now be left operating normally. As long as the external back-up battery voltage is greater than the low voltage disconnect (LVD) level the battery will be connected directly to the supply output and will instantly power the load in case of an AC power failure. With AC power off the battery will then gradually be discharged by the load. When the battery voltage drops below the LVD disconnect level the internal relay will open, preventing the battery from being excessively discharged.

When AC power returns the supply will close the LVD relay and charge the battery to bring the voltage back up to the float voltage level. Battery charge current is limited to the maximum rate determined by the charge current setting of SW 3 and 4 (see table on page 5), while the output voltage will be determined by the battery state of charge, and will rise to the output float voltage over time. The battery will be maintained at the supply output (float) voltage level until AC power is removed.

Batteries connected directly to the supply output (not using the LVD option BAT terminal) will be charged to the supply output voltage level with a current limited to the maximum supply output rating.

The remote shutdown input may be used to disable the supply output by applying a voltage from 2.5 to 16V, and the form-C alarm contacts can be used to remotely monitor fault conditions per the Status Indicators and Alarms table.

PARALLEL OPERATION

Up to 3 matching units without the optional battery backup capability may be connected in parallel to power higher current loads. The unit with the highest output voltage will initially provide most of the load current, and as load current increases the current supplied will tend to balance between the parallel units

CAUTION

Risk of damage to equipment!

- Ensure battery current supplied through the optional internal LVD contactor cannot exceed the current rating of the unit
 - Do not use the internal LVD contactor for parallel applications where load current can exceed the maximum rating of a single unit
-

Status Indicators and Alarms

The 2 LEDs on the front panel and the Form-C alarm contacts on the back indicate the status of the power supply:

Alarm or Notification	Trigger Condition	LOAD Output	BATT LVD	Red FAULT LED	Green POWER LED
Input AC OK, battery charging	Normal operation, battery charging	Enabled	CLOSED	-	ON
Input AC OK, battery charged	Normal operation, battery charged	Enabled	CLOSED	-	ON
AC Under-voltage Warning	Triggers when Input Voltage drops below approx. 90Vac	Enabled	CLOSED	ON	ON
AC Fail	AC fails or front switch is off (Battery above LVD level)	Battery power only	CLOSED	ON	-
Battery Low (when AC Off)	Triggers when battery voltage falls below the LVD threshold	OFF	OPEN	ON	-
System Fault	Indicates internal circuit fault - Clears when all fault conditions are cleared.	Battery power only	CLOSED	ON	-
Battery Over Voltage Fault (AC present)	Triggers when the battery voltage exceeds the internal OVP threshold for 3s	Enabled	OPEN	ON	ON
DC Overvoltage Shutdown	Triggers for output voltage above 16.5/33/66VDC for 1s. Clears when Input power cycled off/on	Battery power only	CLOSED	ON	-
Over-temperature Shutdown	Triggers when internal temperature is too high. Clears when back to normal range.	Battery Power only	CLOSED	ON	-

The form-C alarm contact will be triggered for any condition that lights the red FAULT LED, or shuts down the output of the unit.

PRODUCT SPECIFICATIONS

AC Input (IEC C 14 connector):	110 to 254Vac 50/60Hz
Input Power Factor:	0.99 typ (120Vac input)
Peak Efficiency (typical):	90%
Output V Line Regulation:	+/- 0.1%
Output V Load Regulation:	+/- 1%

Model:	12V 100A	12V 50A	24V 50A	24V 25A	48V 25A	48V 12.5A
Output Voltage ² (Nominal Battery float Voltage) (+/- 0.5%)	13.8V	13.8V	27.6V	27.6V	55.2V	55.2V
Max Current Limit (+5%, -0%)	100A	50A	50A	25A	25A	12.5A
Continuous Current Rating	87A	50A	44A	25A	22A	12.5A
Output Power (max) ³	1200W	690W	1200W	690W	1200W	690W
Output Noise (max mVrms)	30	30	30	30	40	40
Input Current (max at 120Vac)	12A	7A	12A	7A	12A	7A
LVD Threshold V (Default)	11.5V	11.5V	23.0V	23.0V	46.0V	46.0V
LVD Reconnect V (Default)	12.5V	12.5V	25.0V	25.0V	50.0V	50.0V
Idle DC Power Draw ⁴	<200mW	<200mW	<200mW	<200mW	<350mW	<350mW

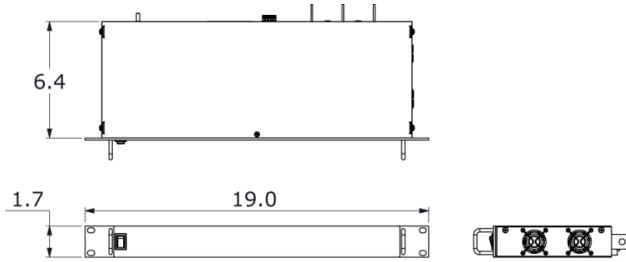
Output Grounding:	Floating, may be connected with Positive or Negative ground
Alarm Output:	Form-C contact, 0.5A 60Vdc max
Remote Shutdown:	2.5 to 16V signal to disable output

² Actual Operating point may be lower due to battery charge requirement

³ Output power will be limited to approximately 1080W when operating with AC input voltage less than 110Vac

⁴ AC mains power off; backup battery connected; LVD open

DC Connectors: (Output, Battery)	Bus Bar, 5/16" bolt hole
Alarm, on/off Connector:	5 pin removable plug, cage clamp type 16 –24 AWG
Operating Temperature Range:	-30C to +60°C ⁵
Storage Temperature Range:	-40 to +70°C
Humidity: (Operating)	10 – 90% (non-condensing)
(Storage)	5 – 95% (non-condensing)
Cooling:	Temperature controlled fan
Regulatory Compliance:	Designed to meet UL/CSA60950-1, Meets FCC Part 15 Class B limits
Dimensions (inches):	



Weight: 7.5lbs/3.4kg

EMC Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules and ICES 003. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced RF technician for help.

⁵ De-rate output 2% per °C above 50°C

ICT LIMITED WARRANTY

ICT Limited Warranty is only intended for the benefit of the original Purchaser of this product. This Warranty is not transferable or assignable without the prior written permission of ICT. ICT's sole obligation and liability under this warranty is limited to either repairing or replacing defective products at the sole discretion of ICT. When repairing or replacing the products, ICT may use products or parts that are new, equivalent to new or re-conditioned. Parts repaired or replaced during the warranty period will be under warranty for the remainder of the warranty period.

The warranty period on ICT products purchased new from ICT is two years. The warranty period for a repaired product or part thereof is ninety (90) days or the remainder of the unexpired term of the new product warranty period, whichever is greater. Repair or replacement of a defective product or part does not extend the original warranty coverage period.

No claim will be accepted unless written notice of the claim is received by ICT in accordance with ICT's Return Material Authorization (RMA) procedure, as soon as reasonably possible after the defect is discovered. A valid product serial number must be provided with the RMA claim to prove eligibility. The RMA form is available on the ICT website at www.ict-power.com/support/warranty-repair/.

The Purchaser shall at their own risk and cost return the defective product to ICT's factory or designated repair center once an RMA is issued by ICT. Return of the products to the customer after repair is completed shall be prepaid by ICT unless otherwise mutually agreed between the parties. Products shipped to ICT which have incurred freight damage will not be covered by this Warranty and any repairs or replacement parts, components or products needed will be invoiced in the full current price amount and returned freight collect to Purchaser. It is the Purchaser's responsibility to check the product upon receipt for any damage during shipping and to contact the carrier or shipper regarding such damage. Product that is returned as defective, which is determined to operate within published specifications will be returned to the Purchaser freight collect.

Warranty commences on the date the product is shipped from the ICT manufacturing facility, or in the case of purchase through an authorized ICT reseller, not more than ninety (90) days after original shipment of this product by ICT.

ICT assigns to Purchaser any warranties which are made by manufacturers and suppliers of components of, or accessories for, the ICT product and which are assignable. ICT makes no representations as to the effectiveness or extent of such warranties, assumes no responsibility for any matters which may be warranted by such manufacturers or suppliers and extends no additional coverage under this Warranty to such components or accessories.

In no event shall ICT be liable for any special, indirect or consequential damages such as, but not limited to, loss of use, business or goodwill, loss of revenue, or loss of profits, which may result, either directly or indirectly, from defects in products provided by ICT.

This Warranty will be void if the product has been subjected to misuse, neglect, accident, exposure to environmental conditions not conforming to the products' limits of operation, improper installation or maintenance, improper use of an electrical source, defects caused by sharp items or by impact pressure, a force majeure event, has been modified or repaired by anyone other than ICT or its authorized representative, has been subjected to unreasonable physical, thermal or electrical stress, improper maintenance, or causes external to the unit including but not limited to general environmental conditions such as rust, corrosive atmospheres, sustained temperatures outside the specified operating range of the equipment, exposure to power surges and/or electrical surges, improper grounding, mould or dust, animal or insect damage, water damage or immersion in liquid of any kind, or if the serial number has been altered, defaced, or removed.

ICT does not control the installation and use of any ICT product. Accordingly, it is understood this does not constitute a warranty of performance or a warranty of fitness for a particular purpose.

This Warranty represents the entire agreement between ICT and Purchaser with respect to the subject matter herein and supersedes all prior verbal or written communications, representations, understandings or agreements relating to this subject.

INNOVATIVE CIRCUIT TECHNOLOGY LTD.
26921 Gloucester Way
Langley, British Columbia, Canada V4W 3Y3
T 604.856.6303 F 604.856.6365 www.ict-power.com