



## Innovative Circuit Technology Ltd.



### **IntelliCharge Series**

Intelligent 3-Stage Battery Charger

#### **INSTRUCTION MANUAL**

855-342-000

#### **Models:**

ICT24012-30BC2, ICT24012-30BC2M

ICT24012-15BC2, ICT24012-15BC2M

ICT24024-15BC2, ICT24024-15BC2M

ICT24024-7BC2, ICT24024-7BC2M

ICT24048-7BC2, ICT24048-7BC2M

 **WARNING**

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**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
- Use only a Lead-Acid battery with rating and capacity appropriate for the model charger in use
- Use an appropriate dc over-current protection device in line with the 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, do not short circuit battery terminals

 **CAUTION**

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**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 rated capacity of the charger output
- Do not block air inlet or outlet openings in the unit
- Do not place the charger directly above or below a battery, due to possible presence of corrosive and/or flammable gasses

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2019

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## INTRODUCTION

The ICT IntelliCharge Series of intelligent battery chargers provide reliable dc power to a system while precisely maintaining an external back-up battery using an intelligent temperature compensated fast-charge algorithm. The wide-ranging power factor corrected input supports operation worldwide, while a built in Low Voltage Disconnect (LVD) relay will protect the battery from over discharge after prolonged periods of backup operation when AC power has failed. Features include:

- Dedicated independently controlled backup battery port with LVD relay
- Intelligent 3-stage fast charge algorithm for battery
- Optional remote battery temperature sensor for precise charge voltage compensation (from -30C to +40C)
- Selectable battery charge settings for AGM, Flooded, or Gel batteries, or fixed Float voltage operation
- Selectable charge rates to accommodate lower capacity batteries
- Wide range Power Factor corrected AC input supports operation world wide
- Floating Form-C alarm contact output supports remote monitoring of unit operation

Model <sup>1</sup>	Output Voltage <sup>2</sup>	Max Output Current	Continuous Output Current
ICT24012-30BC2	13.65V	30.0A	30.0A
ICT24012-15BC2	13.65V	15.0A <sup>3</sup>	12.0A
ICT24024-15BC2	27.3V	15.0A	15.0A
ICT24024-7BC2	27.3V	7.5A <sup>3</sup>	6.0A
ICT24048-7BC2	54.6V	7.5A	7.5A

Optional Accessories:

19 inch Rack Mount Tray (mount up to 2 chargers): ICT-RM1U

Remote Battery Temperature Sensor (10ft): ICT-TMP

## INSTALLATION

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:

- 3 pin Form-C alarm connector plug (installed on unit)

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<sup>1</sup> A suffix letter "M" at the end of the model number is added to denote versions with optional front graphic meter display

<sup>2</sup> Fixed AGM Float Voltage

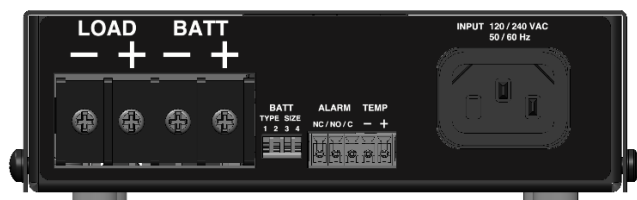
<sup>3</sup> Max output current less than 10% duty cycle

- Power cord (North America 120V 15A)
- Output connector cover (installed on connector)
- Instruction Manual

## **WARNING**

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

- Ensure the nominal battery voltage is correct for the model of charger, and that the battery positive is connected to the BAT positive (+) terminal and the battery negative is connected to the BAT negative (-) 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 any of the LOAD and BATT terminals together, as this will bypass internal circuitry
- Make Ground connection to only a single LOAD or BATT terminal if required. Do not ground both LOAD and BATT as this will bypass internal circuitry
- The internal LVD relay switches the BATT + terminal. Do not connect the battery + to any other terminal
- AC input wiring to the charger must be protected using an outlet with a branch rated circuit breaker of 20A or lower value



Rear View (Connectors and BAT Switch 1-4)

### **Mounting:**

The unit should be placed on a shelf near the backup battery and the load in a location that restricts access to the wiring and battery terminals, such as in an enclosed equipment cabinet. The unit may also be rack mounted using the optional 19" 1U Rack Mount Tray (capacity for 2 chargers) ICT-RM1U.

### **Configure the Charger:**

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

- Choose a lead-acid battery bank with a nominal voltage rating (12/24/48V) that matches the IntelliCharge Series charger output.
- Configure the unit for the battery Type (BATT switches 1, 2) and maximum charge current Size (BATT switches 3, 4) for the backup battery used, by setting the BATT switches 1-4 on the back panel per the

tables below. 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 45Ahr or larger rated battery (3 x 15A) with a 15A max charge setting)

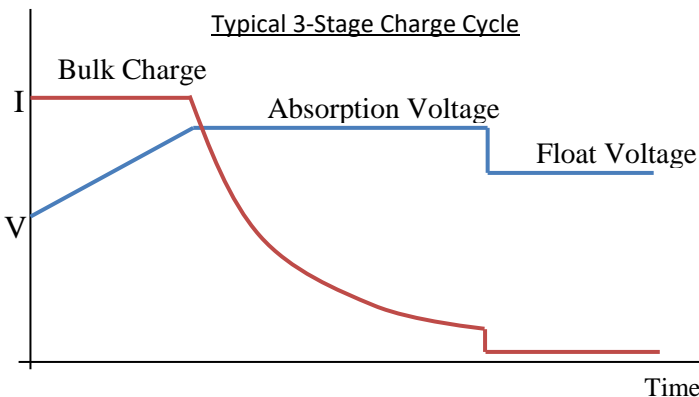
Charge Mode Battery Type	BAT SW1	BAT SW2
Fixed AGM Float (default)	1	1
AGM 3-Stage Fast Charge	1	0
GEL 3-Stage Fast Charge	0	1
FLOODED 3-Stage Fast Charge	0	0

Battery Charge Mode - Switch Settings (1 = UP, 0 = Down)

AGM (or Absorbed Glass Mat) are the most common type of sealed battery  
 GEL is a more durable type of sealed battery, with a gelled electrolyte  
 FLOODED are the traditional vented lead-acid batteries with liquid electrolyte

Fixed AGM Float setting holds the BATT port at the AGM Float Voltage level (see specifications page for value), with a max charge current limit set by the BATT Switch settings 3, 4. Use this setting if the connected load requires a non-varying output voltage, or if the backup battery is not used, or if it does not need to be fast charged.

3-Stage Fast Charge settings will initially boost the voltage limit up to the battery Absorption Voltage (see specifications page for values) for a faster rate of charge, limiting the charge current to the maximum set by BATT Switches 3, 4. Once the battery reaches the Absorption Voltage level, the charger will hold this voltage until the current drops to a low value, or a maximum time limit is reached indicating the battery is fully charged. The charger will then step the voltage down to the Float Voltage level for long term maintenance. This cycle will be repeated when AC power returns after outages, or may be triggered periodically if the battery is left on charge for long periods.



Max Charge (% of Output)	Max Charge (30A Models)	Max Charge (15A Models)	Max Charge (7.5A Models)	BAT SW3	BAT SW4
100% (default)	30A	15A	7.5A	1	1
75%	22.5A	11.3A	5.6A	0	1
50%	15A	7.5A	3.8A	1	0
25%	7.5A	3.8A	1.9A	0	0

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

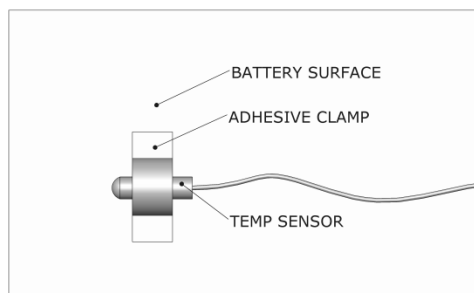
### Connect the Charger:

**Connect the external alarm monitoring** wiring to the Form-C alarm contact output if desired, using 22-26AWG wire clamped in the removable Alarm/Temp plug. (See Alarm Output Contacts table, below)

ALARM Pin	Name	Description
1	NC	Alarm State Normally Closed contact
2	NO	Alarm State Normally Open contact
3	C	Alarm output common

Alarm Output Contacts

**Connect the optional remote battery temperature sensor (ICT-TMP)** to the TEMP input on the back panel removable connector. Using the TMP sensor will enable the unit to compensate the charge Float voltage according to the battery case temperature, to help fully charge cold batteries and ensure warm batteries are not over charged. Connect each of the two wires on the remote temperature probe to the two TEMP inputs on the back panel connector. (Polarity does not matter) Affix the probe body to a side midpoint on one of the battery cases using the adhesive backed plastic clip included with the sensor.



The unit will maintain the charge voltage at the nominal 25°C level if no temperature sensor is detected.

**Wire the load device** to be powered by the charger directly to the LOAD +/- output terminals on the charger back panel. Remove the snap on connector cover and use appropriately sized wire with crimped on spade lugs sized to mate with the output terminal block.

**Connect the backup battery** (or series string of batteries) negative wire to the BATT – terminal. Connect the battery positive terminal to a suitably sized over current protection device (fuse or Circuit breaker, 30A max) then to the charger BATT + terminal. Use appropriately sized wire rated for the maximum operating current, with crimped on spade lugs sized to mate with the output terminal block screws.

Make a **Ground connection** (if required) to only a single +/- battery or load terminal (Load side preferred). Do not connect both the load and battery to ground as this will bypass critical internal circuitry, disabling the charge control functions. The internal LVD relay is in series with the BATT + terminal.

**Check that all connections** to the charger are correct and tight; re-install the snap on connector cover

**Connect the AC power cord**, with the front panel switch in the off position.

## OPERATION

With the unit mounted, wired, and powered as described in the INSTALLATION section, close the external battery breaker, or install the external battery fuse. Turn the front panel power switch to the ON position and check that the green CHARGE indicator on the front panel is flashing, indicating the battery is charging, or is lit continuously indicating the battery is charged or the Fixed Float mode is selected.



Front View (optional meter display shown)

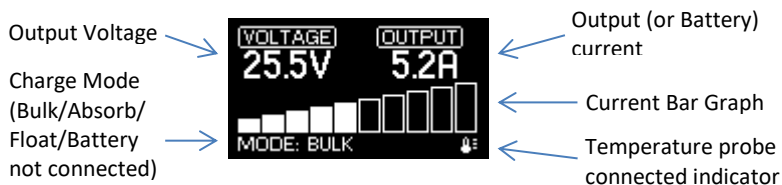
The unit is now ready to power the load, and charge the backup battery. If AC power should fail (or be switched off) the internal LVD relay will keep the battery connected to the LOAD output, to ensure there is no interruption in output

power. Once the battery discharges to the LVD disconnection point the internal LVD relay will open the BATT+ lead to prevent over-discharging the battery. When AC power returns the unit will close the LVD contactor, and initiate a battery charge cycle.

The unit may be used as a fixed output power supply without back-up, if no back-up battery is connected to the BAT terminals. Set the charge mode to Fixed Float on the BATT switch 1 and 2 settings.

### Optional Front Graphic Display

An optional metering display is available on some charger models to show output voltage, output load current and battery current, plus an indication of the charge mode (Bulk, Absorb, or Float, or Battery not connected), Temperature Probe connection, and any faults or warnings. The typical home screen is as shown. Press the button below the display to turn on the display, and toggle the display between output current and battery current measurements. Each step of the bar graph represents a 10% increment in current. Note that the display will turn off approximately 15 minutes after last use.



### 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 charger:

Alarm or Notification	Trigger Condition	LOAD Output	BATT LVD	Red FAULT LED	Green CHARGE LED
<b>Input AC OK, battery charging</b>	Normal operation, battery charging	Enabled	CLOSED	-	BLINK
<b>Input AC OK, battery charged</b>	Normal operation, battery fully charged (or unit is set to Fixed Float V mode)	Enabled	CLOSED	-	ON
<b>AC Under-voltage Warning</b>	Triggers when Input Voltage drops below approx. 90Vac	Enabled	CLOSED	ON	-
<b>AC Fail</b>	AC fails or front switch is off (Battery above LVD level)	Battery power only	CLOSED	ON	OFF
<b>Battery Low</b>	Triggers when battery	OFF	OPEN	ON	OFF



Alarm or Notification	Trigger Condition	LOAD Output	BATT LVD	Red FAULT LED	Green CHARGE LED
(when AC Off)	voltage falls below the LVD threshold				
<b>System Fault</b>	Indicates internal circuit fault - Clears when all fault conditions are cleared.	Battery power only	CLOSED	ON	OFF
<b>Battery Over Voltage Fault (AC present)</b>	Triggers when the battery voltage exceeds the internal OVP threshold for 3s	Enabled	OPEN	ON	OFF
<b>DC Overvoltage Shutdown</b>	Triggers when the Load output voltage rises above <b>16.5/33/66VDC for 3s.</b> Clears when Input power cycled off/on	Battery power only	CLOSED	ON	OFF
<b>Over-temperature Shutdown</b>	Triggers when internal temperature is too high. Clears when back to normal range.	Battery Power only	CLOSED	ON	OFF

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.

**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.

## PRODUCT SPECIFICATIONS

AC Input (IEC C 14 connector):

100 to 254Vac 50/60Hz

Peak Efficiency (typical):

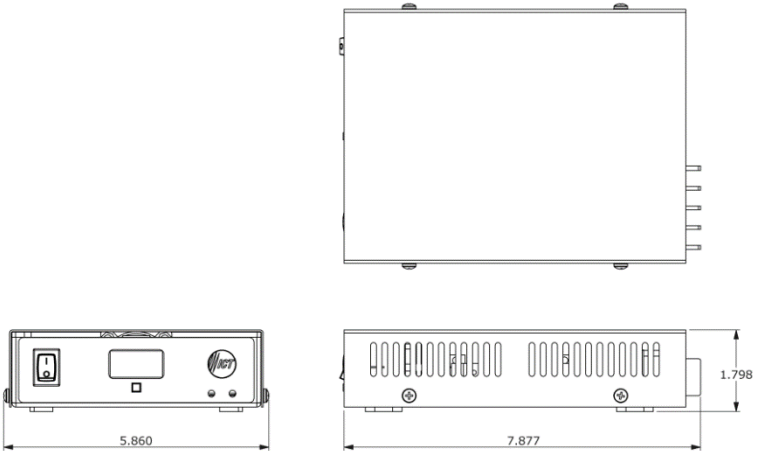
90%

Model:	12V 30A	12V 15A	24V 15A	24V 7.5A	48V 7.5A	
Output Voltage range (Operating point set by auto 3 stage charge cycle)	12 – 15.5V	12 – 15.5V	24 – 31.0V	24 – 31.0V	48 – 62V	
Max Current Limit at nominal rated output (12V, 24V or 48V) (+3%, -0% tol)	30A	15A	15A	7.5A	7.5A	
Max Current Limit at max V <sup>4</sup>	23A	11.5A	11.5A	5.75A	5.75A	
Continuous Current Rating at nominal rated output	30A	12A	15A	6A	7.5A	
Output Power (max, at nominal V, 12, 24, or 48V)	360W	180W	360W	180W	360W	
Input Current (max at 90Vac)	4.8A	2.4A	4.8A	2.4A	4.8A	
Idle DC Power Draw <sup>5</sup>	<200mW	<200mW	<200mW	<200mW	<200mW	
3-Stage Charge Parameters (at 25°C)						
Absorb V:	AGM	14.55	14.55	29.1	29.1	58.2
	Flooded	14.4	14.4	28.8	28.8	57.6
	Gel	14.2	14.2	28.4	28.4	56.8
Float V:	AGM	13.65	13.65	27.3	27.3	54.6
	Flooded	13.2	13.2	26.4	26.4	52.8
	Gel	13.8	13.8	27.6	27.6	55.2
Temperature Compensation of V absorb and V float (with optional remote temp sensor ICT-TMP)		-30mV/°C	-30mV/°C	-60mV/°C	-60mV/°C	-120mV/°C
LVD Threshold V		11.0V	11.0V	22.0V	22.0V	44.0V
LVD Reconnect Threshold V		12.5V	12.5V	25.0V	25.0V	50.0V

<sup>4</sup> Output current limit linearly de-rates with output voltage. Max limit at nominal rated 12.0, 24 or 48.0V, reducing at maximum output voltage of 15.5, 31, or 62V to levels shown

<sup>5</sup> AC mains power off; backup battery connected; LVD open

Alarm Output:	Form-C contact, 0.5A 60Vdc max
DC Connectors: (Output, Battery)	Terminal Block, M4 Screws, 9mm spade max width
Alarm Connector:	3 pins on 5 pin removable plug, cage clamp type 16 – 28AWG
Bat Temp Sensor Connector:	2 pins on 5 pin plug
Operating Temperature Range:	-30C to +60°C <sup>6</sup>
Storage Temperature Range:	-40 to +70°C
Humidity: (Operating) (Storage)	10 – 90% (non-condensing) 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 (lbs/kg):

2.61lbs/1.19kg

<sup>6</sup> De-rate output 1% 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/](http://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.

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