REVISIONS				
REV	ECO	DESCRIPTION	DATE	BY
001	5760	PRODUCTION RELEASE	9/23/01	BF

Product Specification

11020C01 DC-DC CONVERTER TRAIL CHARGER

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES [MM]
TOLERANCES ARE: .XX ± .10 [X.X ± 2.5]
.XXX± [X.XX±]
INTERPRET GEOMETRIC DIMENSIONS AND TOLERANCING PER ASME Y14.5-1994
DRAWINGS IN THIS DOCUMENT ARE NOT TO SCALE

APPROVALS	DATE
DRAWN JAR	05MAR09
PROJECT ENGR	
ENGR MANAGER	
SALES/MRKTG	

SURE POWER INDUSTRIES, INC.

TITLE
MODEL NO: 11020C01
TRAIL CHARGER
SPECIFICATION OUTLINE

SIZE	CAGE CODE NO.	DRAWING NO.	REV
A	55156	11020C01	001

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THEORY OF OPERATION

The 11020C01 is a specially designed DC/DC converter that is used to charge a battery from a 12V source. An example is a battery that is mounted on the trailer of a vehicle. The distance between the alternator of the vehicle and the trailer-mounted battery makes it difficult to get adequate charging voltage to the battery. The 11020C01 has a microprocessor on-board to measure the input voltage, output voltage and current, boost voltage, temperature sensors. An Intelligent Power Switch on the output is used to provide consistent, robust protection and control of the output current.

The 11020C01 has two modes of operation:

- **Boost Mode:** This mode is enabled when input voltage is nominal (e.g.. Vin ≤ (Vout + 0.6 Vdc)). When the converter is operating in this mode, the output voltage is temperature compensated, see graph 1.
- **Bypass Mode:** This mode is enabled when the input voltage is greater than the output voltage. In this mode, the converter will enter a “burst” operation whereby the output will burst on and off when the pass through current exceeds 20ADC.

The microprocessor measures the temperature of the converter and provides a temperature compensated output, optimized for recharging AGM batteries. This is most effective when the charger and battery are at the same temperature (mounted in near proximity).

Monitoring the internal temperature provides thermal protection. When the microprocessor detects extreme temperatures, action is taken to protect the unit, including shutdown of output.

The converter is designed to withstand the severe electrical environment of heavy-duty trucks and off highway equipment. The converter can withstand load dump, reverse battery, short circuit, and over-temperature conditions without sustaining damage.

The unit is adequately sealed to meet the performance standards called out in SAE J1455 Section 4 specification relative to Humidity, Salt Spray, Splash and Dust bombardment (See table 4, p. 5 of this document).

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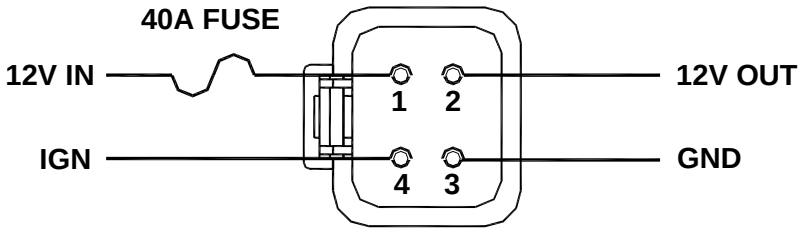
FUNCTIONAL DESCRIPTION

Connections to the unit are made via a 4-pin Deutsch connector. The terminals are as follows:

Conn – Pin	Name	Notes:
J1-1	Vin	Provides the input voltage to the converter.
J1-2	Vout	Output to the battery to be charged. Keep wiring as short as possible.
J1-3	Ground	System ground. Must be common to both input and output.
J1-4	Ignition	Enables the converter when Ignition is on.



4 PIN MATING CONNECTOR
(DEUTSCH)
HOUSING: DTP06-4S
SOCKET: 1062-12-0166
LOCK: WP4S

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LED indications:

The STATUS LED will indicate several different conditions of the Trail Charger. This is accomplished by the use of a Bi-Color LED that will indicate with either a solid color or a blinking color at three different blink rates, see table below:

RATE	TIMING
Slow	1 second on, 1 second off
Medium	500ms on, 500 ms off
High	250ms on, 250ms off

Definition of indications is found in the following table:

INDICATION	STATUS	Fault Condition	Input Command	
			Shutdown	Reduce
LED off	Module off, ignition or input voltage not present.	—	—	—
RED, blink, high-rate	FAULT, any on the fault list, which follows this table.	Any Fault condition	—	—

A **RED LED blinking** at a **high rate** indicates one of the following **fault** conditions exist:

- Input over-voltage limit.
- Input under-voltage limit.
- Output over-voltage limit.
- Output over-current limit.
- Output FET's over thermal limits.

A fast blinking RED from any fault indication has a higher priority than all other indications if the ignition is on.

ENVIRONMENTAL SPECIFICATIONS

Characteristic	Parameter	Unit	Notes:
Operational Temperature Range	-40 to +85	°C	As tested in Tenney T10RC-1.5 thermal chamber.
Maximum Heatsink Temperature	100	°C	Heatsink temperature must be kept below this value to prevent activation of over-temperature protection circuit.
Humidity	0 to 100	%RH	Tested per SAE J1455, Section 4.2.3
Salt Spray	48	Hrs	Tested per SAE J1455 Section 4.3
Splash			per SAE J1455 Section 4.4, Splash only.
Dust			per SAE J1455 Section 4.7.
Altitude	12000	Ft	per SAE J1455 Section 4.8.
Vibration			per SAE J1455 Section 4.9 and Appendix A, Category 2.
Handling Shock	Will show damage		per SAE J1455 Section 4.10

ELECTRICAL SPECIFICATIONS

MAXIMUM RATINGS:

Maximum ratings establish the maximum electrical rating to which the unit may be subjected without damage.

Characteristic	Parameter	Unit	Notes:
Standoff Voltage	24	V	This is maximum voltage applied between input and GND that the unit will standoff without causing damage to the unit.
Time at Standoff	5	min	
Reverse Polarity	-24	V	This is the maximum reverse voltage that may be applied between input and GND pins.
Time at Reverse Polarity	5	min	Tested at 85°C. Per SAE J1455, Section 4.11.1
Maximum Input Current	27	A	When operating in boost mode
Maximum Output Current	23	A	Maximum output current when in boost mode. Above 60°C ambient temperature the maximum output current must be derated.
Maximum Output Current (Bypass mode)	25	A	Maximum RMS output current when Vin>Vout. (bursting output)

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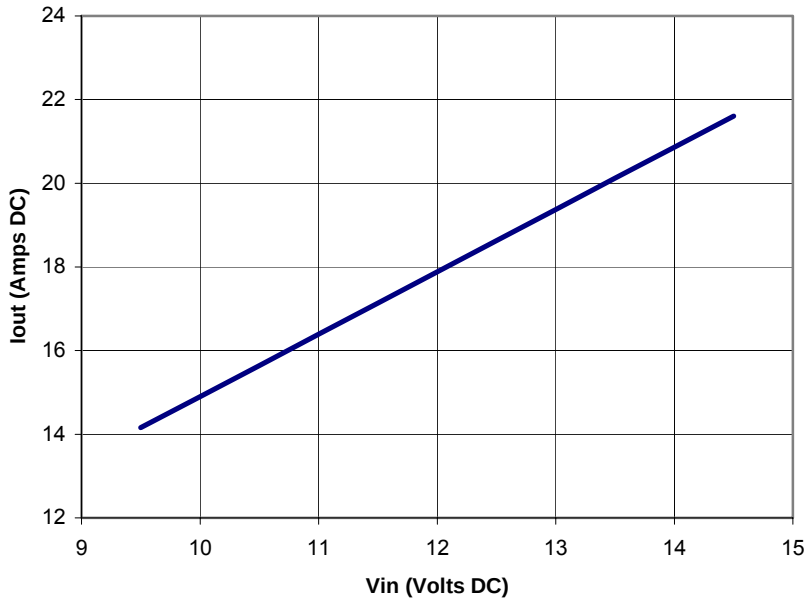
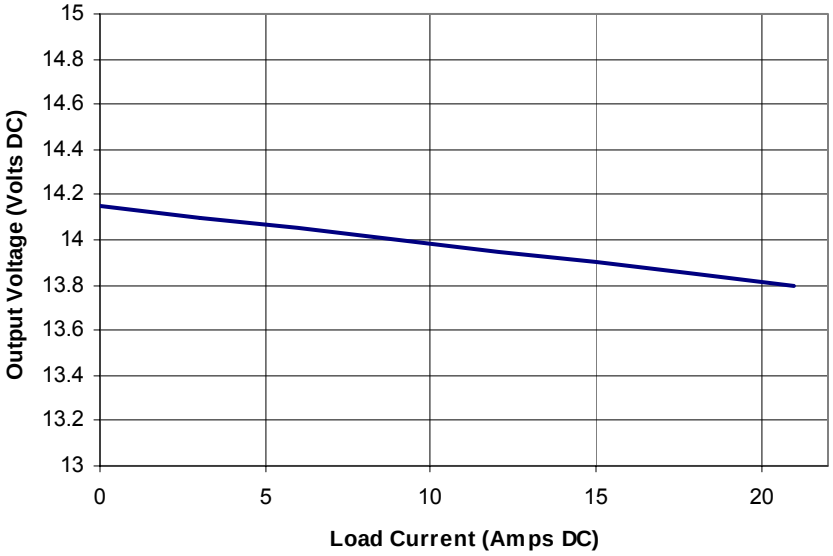
Maximum Iout Vs. Vin



Load Regulation



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ELECTRICAL CHARACTERISTICS

Unless otherwise stated, conditions apply to full temperature range and full input voltage range.

Characteristic	MIN	TYP	MAX	Unit	Notes:
Input Under-Voltage Turn Off	7.8	8.0	8.2	V	Input voltages below this level will cause the output to turn off.
Input Under-Voltage Recovery	10.3	10.5	10.7	V	Input voltages below this level will cause the output to turn off.
Input Over-Voltage Turn off	16.7	17.0	17.3	V	Input voltages above this level will cause the output to turn off.
Input Over-Voltage Recovery	15.5	15.8	16.1	V	Input voltages below this level will cause the output to turn on.
Input Quiescent Current	-	1.5	2	mA	Current draw from the input with no load attached to the output(J1-2), and ignition off. Measured with the Input voltage at 12.6Vdc.
Output Quiescent Current	-	1.5	2	mA	Current draw from the output (J1-2) with ignition off. Measured with the output voltage at 12.6Vdc.
Efficiency	-	90	-	%	Over entire input voltage range at rated output current.
Output Voltage	-	14.2	-	V	The output voltage is temperature compensated. See “Temperature Compensation”graph on Pg. 8.
Output Current Limit Boost Mode	-	20	-	A	Maximum current when in boost mode. See “Maximum Iout Vs Vin” graph on Pg. 6
Output Current Limit Bypass Mode	-	23	-	A	See “Maximum Iout Vs Vin” graph on Pg. 6

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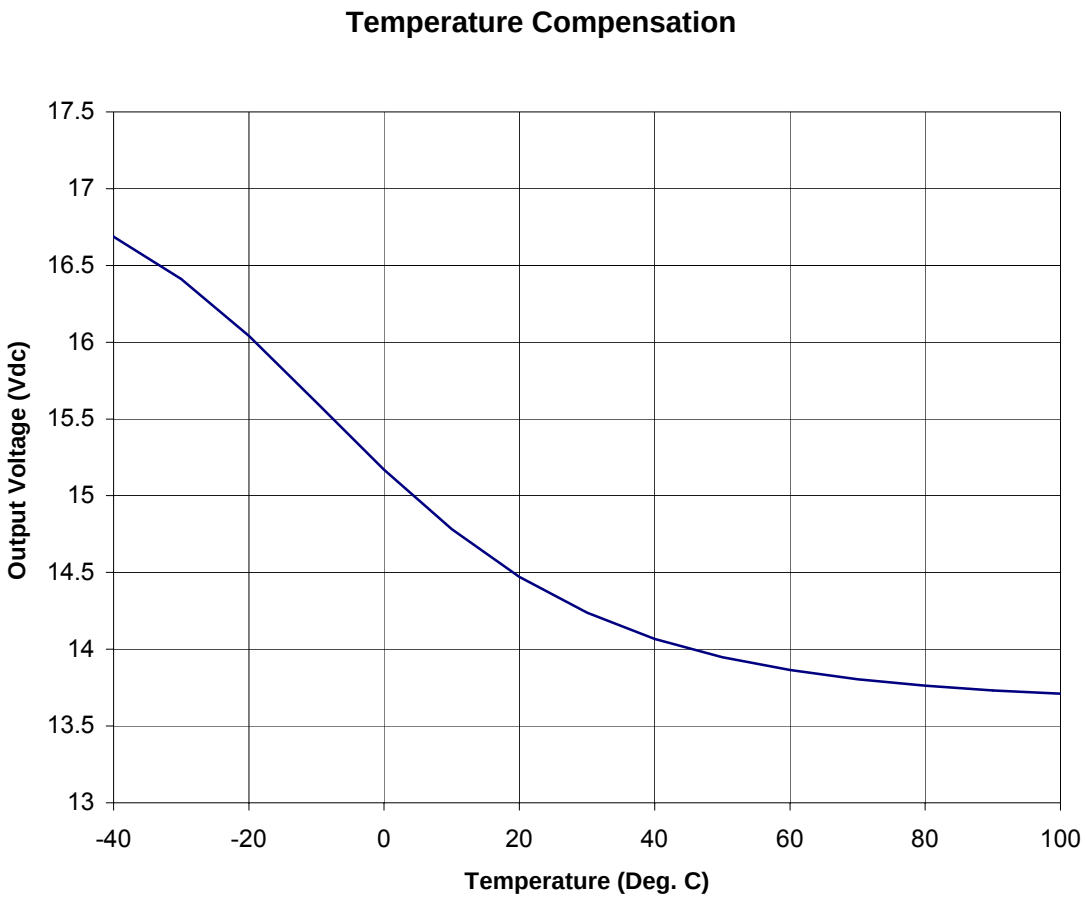
Temperature Compensation (The output is temperature compensated to provide a higher voltage level at lower temperatures as recommended by AGM battery manufacturers.)



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Installation Wire Size: (Proper installation requires a minimum run length of wire on the input terminal. Use no less than 10Ft of 10AWG wire. Use standard wiring practice for other connections).

Input Wire Length	Wire Gauge
10 – 20 Ft.	14
20 - 29 Ft.	12
30 – 39 Ft.	10
40 – 49 Ft.	8
50 – 59 Ft.	8
≥60 Ft.	6

ELECTROMAGNETIC COMPATIBILITY

Radiated Immunity Test	Level	Notes:
Immunity to Electromagnetic Fields, 30 MHz to 18 GHz, Absorber-Lined Chamber	60V/m	SAE J1113-21, Class B, Region 2, L3
Immunity to Radiated Electromagnetic Fields—Bulk Current Injection (BCI) Method	60mA	SAE J1113-4, Class B, Region 2

Emissions Limit Test	Level	Notes:
Radiated Emissions	Class 2	SAE J1113-41
Conducted Emissions	Class 2	SAE J1113-41

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ELECTROMAGNETIC COMPATIBILITY (continued)

Transient Immunity Tests	Level	Notes:
Load Dump	$14 + 86e^{t/(0.4)}$	SAE J1455, Section 4.11.2.2.1, Table 4a
Inductive Switching	$14 \pm 600e^{t/(0.001)}$	SAE J1455, Section 4.11.2.2.2, Table 4a
Mutual Inductance	$14 \pm 300e^{t/(0.00015)}$	SAE J1455, Section 4.11.2.2.3, Table 4a

Electrostatic Discharge Immunity	Level	Notes:
ESD, In Vehicle	±8kV direct ±15kV air	SAE J1113-13, Section 4, Class C, Region 2
ESD, Package and Handling	±8kV direct ±15kV air,	SAE J1113-13, Section 5

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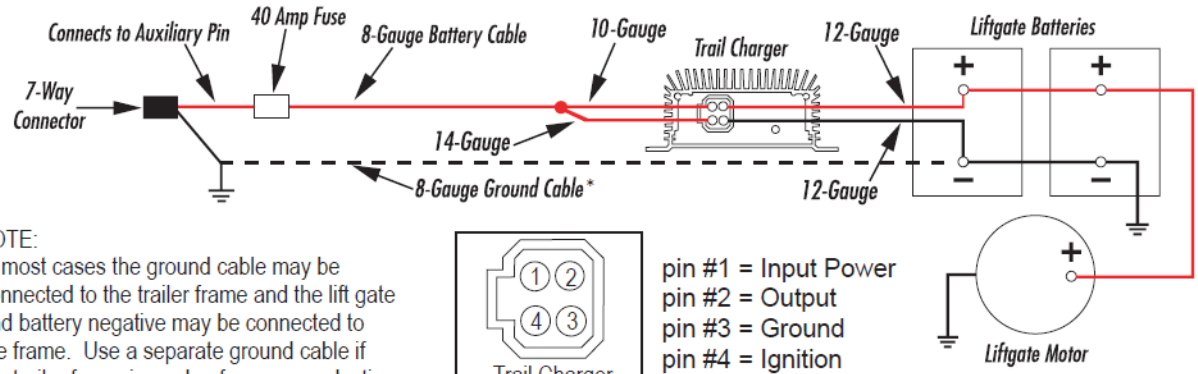
WIRING DIAGRAM



*NOTE:
In most cases the ground cable may be connected to the trailer frame and the lift gate and battery negative may be connected to the frame. Use a separate ground cable if the trailer frame is made of a poor conductive metal such as stainless steel.

Trail Charger connector

pin #1 = Input Power
pin #2 = Output
pin #3 = Ground
pin #4 = Ignition

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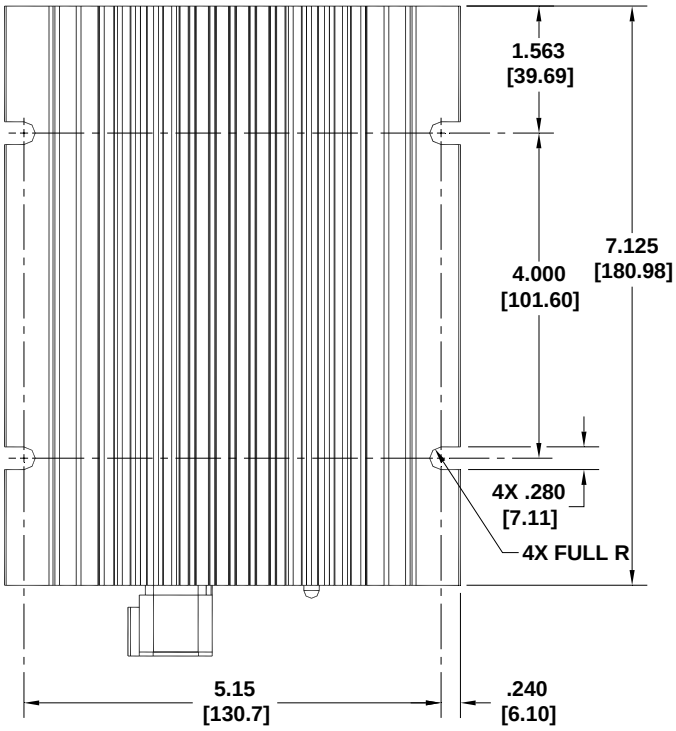
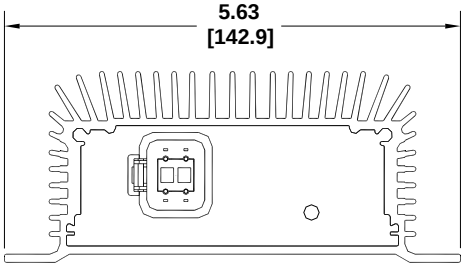
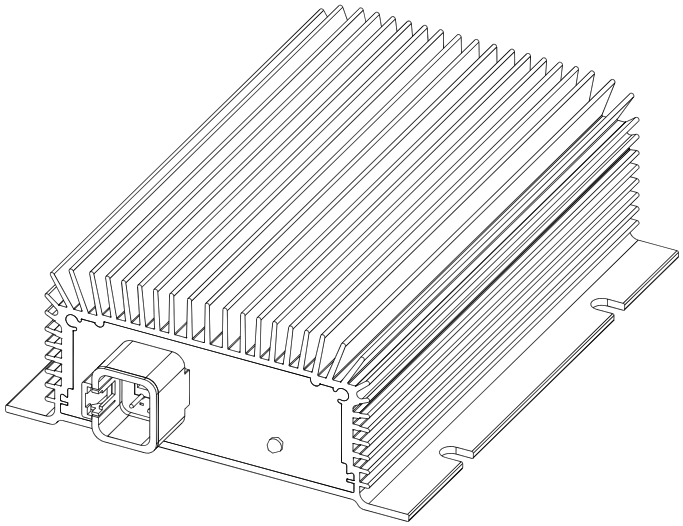
UNIT DIMENSIONS







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