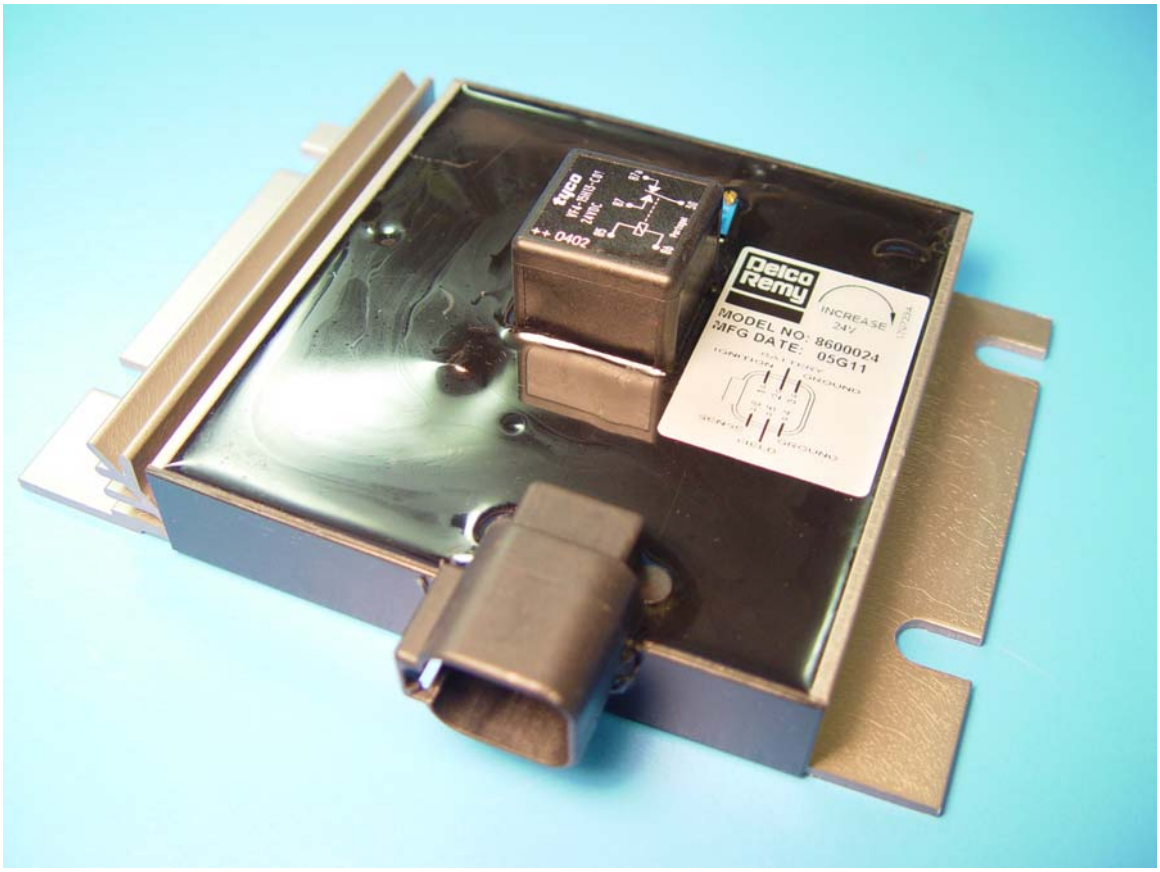
REVISIONS				
REV	ECO	DESCRIPTION	DATE	BY
001	4731	PRODUCTION RELEASE	6/13/06	BF
002	4849	SATURATION VOLTAGE FROM 2.4V AT 10A TO 10A @ 27V - .64 [16.26] DIM TO .67 [17.0] - +105°C TO +85°C	10/17/06	BF
003	4858	CHG 85°C TO 105°C IN 'OPER. AMBIENT TEMP RANGE' – CHG 85°C TO 105°C IN 'DC ELECTRICAL CHARACTERISTICS'	11/16/06	BF

20510
24V, 10 AMP REGULATOR, SEALED CONNECTOR



UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES [MM]
TOLERANCES ARE: .XX ± .10 [X.X ± 2.5]
.XXX ± .030 [X.XX ± 0.76]
INTERPRET GEOMETRIC DIMENSIONS AND TOLERANCING PER ASME Y14.5-1994
DRAWINGS IN THIS DOCUMENT ARE NOT TO SCALE

APPROVALS	DATE
DRAWN GF	11/29/05
PROJECT ENGR	
ENGR MANAGER	
SALES/MRKTG	

SURE POWER INDUSTRIES, INC.

TITLE
MODEL NO: 20510
REG,8600024,NO COVER
6 PIN CONNECTOR
SPECIFICATION OUTLINE

SIZE	CAGE CODE NO.	DRAWING NO.	REV
A	55156	20510	003

SCALE: NONE FILE: 20510-003 SHEET 1 OF 7

REVISIONS				
REV	ECO	DESCRIPTION	DATE	BY
		- SEE SHEET 1-		

THEORY OF OPERATION

The 20510 is a 24V, 10A regulator designed for field regulation of heavy duty alternators. The regulator is enabled through the ignition input. When ignition is applied, the module begins to regulate the alternator field. When ignition is removed, the module turns off to reduce battery drain. The regulator will switch from the default SENSE input for regulation to the BATTERY input under certain conditions. The regulated set point is adjustable for the SENSE and BATTERY inputs.

The regulator is designed to withstand the severe electrical environment of heavy-duty trucks, buses, and off-highway equipment. The regulator can withstand load dump, reverse battery, jump-starts, and inductive spikes.

FUNCTIONAL DESCRIPTION

UNIT CONNECTIONS:

The unit has six connections made through a 6-Pin DTF13-6P Deutsch Connector. Remote sensing is available which allows the user to sense the battery voltage using a Kelvin line. The connections are:

BATTERY: (Pin 2)

This termination supplies power to the Field pin when regulating. All internal regulation set points are referenced from this connection.

IGNITION: (Pin 1)

This termination enables regulator function. When power is applied, the regulator is turned ON.

FIELD: (Pin 5)

This termination is to be connected to the alternator field. Battery power is switched to this terminal to control the field / alternator output

GROUND: (Pin 3,4)

This terminal is utilized for unit ground. Internal current paths and transient protection circuits are returned to this terminal.

SENSE: (Battery Sense – Pin 6)

This terminal is utilized for sensing the battery voltage. It connects directly to the POSITIVE (+) battery terminal. The sense lead is a low current, voltage sensing, and Kelvin connection. The Kelvin connection allows for voltage sensing without any discrepancies due to line loss.

SURE POWER INDUSTRIES, INC.

TITLE	MODEL NO: 20510 REG,8600024,NO COVER 6 PIN CONNECTOR SPECIFICATION OUTLINE		
SIZE A	CAGE CODE NO. 55156	DRAWING NO. 20510	REV 003
SCALE: NONE	FILE: 20510-003	SHEET 2 OF 7	

REVISIONS				
REV	ECO	DESCRIPTION	DATE	BY
		- SEE SHEET 1-		

ENVIRONMENTAL SPECIFICATIONS

Characteristic	Parameter	Unit	Notes:
Operational Ambient Temperature Range	-35 to +105	°C	Case temperature not to exceed 125°C
Storage Temperature Range	-55 to +150	°C	
Humidity	0 to 95	%RH	+/-3% @ 10A load. IAW SAE J1455 section 4.2.3. Figure 4a.
Thermal Shock			@ 10A load. IAW SAE J1455 section 4.1.3.2. Figure 2c.
Salt Spray	168	hrs	IAW ASTM B117

ELECTRICAL SPECIFICATIONS

MAXIMUM RATINGS:

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

Characteristic	Symbol	Parameter	Unit	Notes:
Input Voltage	V_{INMAX}	32	V	IAW SAE J1455 section 4.11.1.1.1. table 3b.
Jump Start Voltage	V_{JS}	48	V	IAW SAE J1455 section 4.11.1.1.1. table 3b.
Jump Start Time	T_{JS}	5	Min	Minimum time the input may be subjected to the jump start voltage without damage.
Reverse Polarity	V_{RP}	-24	V	External fuse must be used on BATTERY and IGNITION that protects unit against reverse polarity. Surpasses specification in SAE J1455 section 4.11.1.1.1 table 3b.
Time at Reverse Voltage	t_{RP}	1	Min	

SURE POWER INDUSTRIES, INC.

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A	55156	20510	003

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REVISIONS				
REV	ECO	DESCRIPTION	DATE	BY
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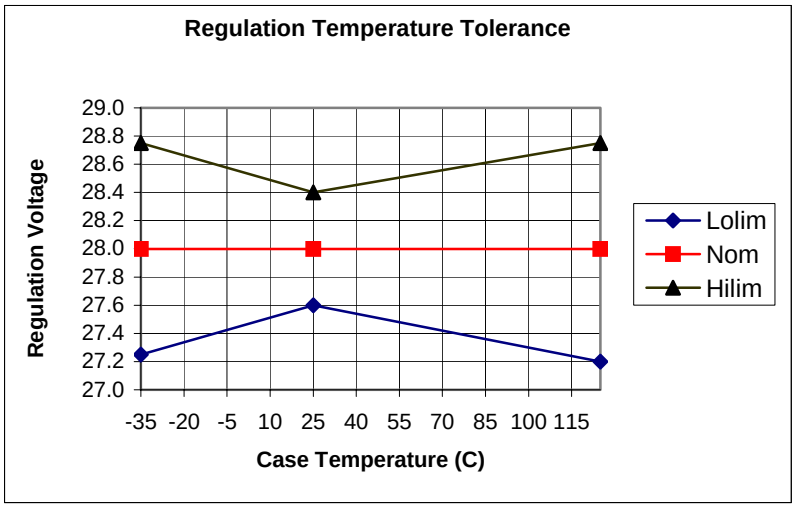
DC ELECTRICAL CHARACTERISTICS

Unless otherwise stated, conditions apply to full temperature range (-35°C to +105°C) and full voltage range (18V to 32V).

Characteristic	Symbol	MIN	TYP	MAX	Unit	Notes:
Voltage Setting	V_{SET}	27.0	28.0	29.0	V	@ 25°C, 50% maximum alternator output at 6000 RPM. See temperature curve below.
Regulation	V_{REG}			0.3	V	Tested with constant 30A load from 1800 to 7000 RPM. 0.5V max with constant 6000RPM from 5% to 95% full alternator capacity.
Device Turn On Time	t_{ON}	95	125	155	µs	Output high side switch turn on time.
Quiescent Current	I_Q			1.0	mA	@ 25°C, IGNITION off, and V_{BAT}=25.2V.
Ignition Input Voltage	V_{IGN}	16	16.5	17	V	Voltage required on the IGNITION Input to turn on regulator activity.
Over Voltage Shutdown	V_{OV}		36	40	V	If V_{BAT} is above V_{OV} level for t_{OV} the internal relay will open the battery-field circuit.
Over Voltage Shutdown	t_{OV}	1	2.5	3.5	S	If V_{BAT} is above V_{OV} level for t_{OV} the internal relay will open the battery-field circuit.
Saturation Voltage	V_{FWD}		1.5	2.25	V	@ 12.0A, 27V, 25°C case temp or 10A @ 27V, 125°C case temp
Output Current	$I_{R,MAXC}$			10	A	@ 105°C case temperature, to withstand 17A for two minutes at -35°C case temperature. Over current / short circuit protected.
Short Circuit Current	I_{SC}		24		A	@ 25°C
Sense Crossover Voltage	V_{SENSE}	(V_{SET} X 0.5) -1	V_{SET} X 0.5	(V_{SET} X 0.5)+1	V	Voltage at which unit will switch to BATTERY input for regulation.
Field Frequency	f_{FLD}	325	400	475	Hz	

*Graph represents the regulation voltage limits over the entire temperature range.



SURE POWER INDUSTRIES, INC.

TITLE: **MODEL NO: 20510**
REG,8600024,NO COVER
6 PIN CONNECTOR
SPECIFICATION OUTLINE

SIZE	CAGE CODE NO.	DRAWING NO.	REV
A	55156	20510	003

SCALE: NONE | FILE: 20510-003 | SHEET 4 OF 7

REVISIONS				
REV	ECO	DESCRIPTION	DATE	BY
		- SEE SHEET 1-		

ELECTROMAGNETIC COMPATIBILITY:

Transient Immunity Tests	**Level**	**Notes:**
Load Dump	$27 + 173e^{t/(0.3)}$	IAW with SAE J1455 Section 4.11.2.2, Table 4b. Pulse applied to BATTERY, SENSE, and IGNITION pins. Spec superceded by Delco, 200V, 10ms rise time
Inductive Switching Kick	$28 \pm 600e^{t/(0.001)}$	IAW with SAE J1455 Section 4.11.2.2, Table 4b. Pulse applied to BATTERY, SENSE, and IGNITION pins
Mutual Inductance	$28 \pm 300e^{t/(0.00015)}$	IAW with SAE J1455 Section 4.11.2.2, Table 4b. Pulse applied to all I/O.

Electrostatic Discharge Immunity	**Level**	**Notes:**
In Vehicle ESD	±8 kV direct ±15 kV air	IAW with SAE J1113/13 utlizing a 330pf/2000ohm discharge network.
Handling ESD	±8 kV direct ±15 kV air	IAW with SAE J1455 Section 4.11.2.2.5.1 / SAE J551/15 utilizing a 150pF/150ohm discharge network.

Immunity Test	**Level**	**Notes:**
Absorber Lined Chamber 100MHz to 1GHz	50V/m	Ref. SAE J1113/21. Amplitude Modulation: 80% at 1kHz. Antenna and DUT at one meter.
Stripline Test Method 10kHz to 100MHz	100V/m	Ref. SAE J1113/23. Amplitude Modulation: 80% at 1kHz.

Emissions Limit Test	**Level**	**Notes:**
Radiated Emissions	Class 5:2000	IAW with SAE J1113/41.
Conducted Emissions	Class 5:2000	IAW with SAE J1113/41.

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6 PIN CONNECTOR
SPECIFICATION OUTLINE

SIZE	CAGE CODE NO.	DRAWING NO.	REV
A	55156	20510	003

SCALE: NONE | FILE: 20510-003 | SHEET 5 OF 7

REVISIONS				
REV	ECO	DESCRIPTION	DATE	BY
		- SEE SHEET 1-		

MECHANICAL SPECIFICATIONS

Connector: 6-Pin DTF13-6P Deutsch Connector.

Mating Harness: Deutsch housing DT06-6S, socket 0462-209-16141, locking wedge W6S

Housing: Clear anodized aluminum

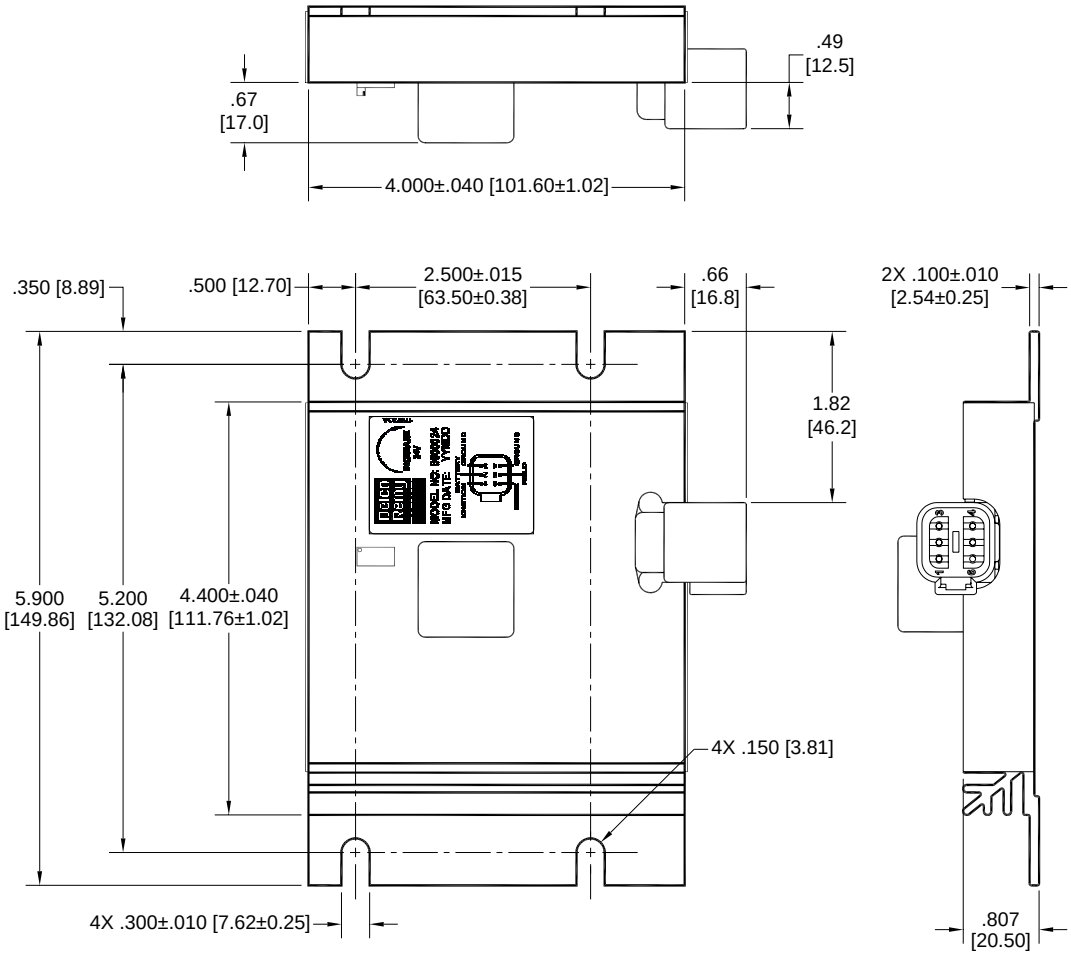
Weight: Approximately 0.95lb / 0.432kg

SURE POWER INDUSTRIES, INC.

TITLE	MODEL NO: 20510 REG,8600024,NO COVER 6 PIN CONNECTOR SPECIFICATION OUTLINE
SIZE A	CAGE CODE NO. 55156
DRAWING NO.	20510
REV	003
SCALE: NONE	FILE: 20510-003
SHEET	6 OF 7

REVISIONS				
REV	ECO	DESCRIPTION	DATE	BY
		- SEE SHEET 1-		

UNIT DIMENSIONS/CONNECTION



SURE POWER INDUSTRIES, INC.

TITLE
MODEL NO: 20510
REG,8600024,NO COVER
6 PIN CONNECTOR
SPECIFICATION OUTLINE

SIZE	CAGE CODE NO.	DRAWING NO.	REV
A	55156	20510	003

SCALE: NONE | FILE: 20510-003 | SHEET 7 OF 7