

## SEPARATELY EXCITED NON-PROGRAMMABLE CONTROLLERS FOR GOLF CART AND NEIGHBORHOOD ELECTRIC VEHICLE APPLICATIONS

- 300 and 500 amp controllers available for 36 and 48 volt applications
- 18-20 MPH with new replacement controller on most stock carts
- Units pre-programmed to particular cart and motor applications for optimal performance
- No setting changes or programming necessary, PLUG AND PLAY
- Great for Stock and Upgraded motors
- Part Numbers shown below include all adapter harnesses necessary

### Specifications\*

<b>Package dimensions:</b>	See Drawing link below
<b>Voltage Range</b>	24-48 Volts DC
<b>Maximum Available armature current</b>	300 & 500 amps (50% on time)
<b>Maximum Available field current</b>	20 & 30 amps
<b>Operating temperature</b>	-40°C to +50°C
<b>Storage temperature</b>	-40°C to +85°C
<b>Thermal Protection</b>	Non-Linear 90°C Cutback
<b>Accelerator Input</b>	5k to 0 Ohms, 0 to 5k Ohms or 3 wire
<b>Power Devices</b>	MOSFETS
<b>Motor Reversing</b>	Solid State
<b>Operating frequency (Armature):</b>	15 kHz
<b>Operating frequency (Field)</b>	2.2kHz
<b>Modulation</b>	PWM
<b>Adjustment Method</b>	RS232
<b>On-board Coil Suppression</b>	Yes
<b>Reverse Battery Protection</b>	Yes
<b>Regenerative Braking</b>	Yes
<b>Zero Speed Detection</b>	Yes
<b>Reverse Buzzer Driver</b>	Yes
<b>SRO</b>	Limited
<b>Plugging (F to R)</b>	Yes
<b>Reverse Speed Limit</b>	Adjustable
<b>Operating Voltage</b>	Max 125% Nom.
<b>Operating Voltage</b>	Min 50% Nom.

### Control Feature Descriptions

#### Regenerative Braking –

1. Control keeps vehicle from over speeding and regulates speed to value set by function 20 in Table 1 or the value set by table 2. This function is engaged when start switch is closed and speed reaches value set by function 20 or the value set by table 2.
2. Control slows vehicle down to approximately 10 MPH when start switch is opened.

**Zero Speed Detection** – Control prevents vehicle from rolling away once control see's zero speed and no further inputs are received at the control. This function retarding torque is limited by max current allowed as set by function 5.

#### **Reverse Buzzer Driver –**

1. Turns customer supplied buzzer on when control see's reverse signal.
2. Buzzer is also turned on and off when zero speed detect is initiated.
3. Buzzer current not to exceed 50mA.

#### **SRO – Static Return to Off –**

1. Vehicle will not run if the key is turned on with accelerator switch closed.
2. Vehicle speed is limited to Pedal up speed limit if the key is opened when the accelerator pedal is full on.

**Plugging** – Control provides retarding torque when a direction switch occurs. Retarding torque is limited by function 5 setting table 1

**Reverse Speed Limit** – Control limits motor volts to a valued specified by function 12, table 1, when control see's reverse switch closed. Function 3, table 1, is doubled in reverse.

**Reverse Battery Protection** – If battery cables are hooked up backwards control will not allow line contactor to close.

**Throttle wire Protection** – Control will not run if +5v or wiper negative connection is open. 4V or greater at start switch closure.

**Reverse Motor Protection** – If (I) A and (I) F lead is switched control will not be damaged.

**Stall Protection** – If armature current is 145A or greater when speed is 1 MPH or less for 4 seconds,

#### **Validation Testing**

**Thermal Shock** – One control was soaked for one hour at -40oC then transitioned to 105oC within 5 seconds and soaked for 1 hour, to complete one cycle. Test preformed 100 cycles and control card operated properly after test.

**Environmental Protection** – TESTED TO IP53

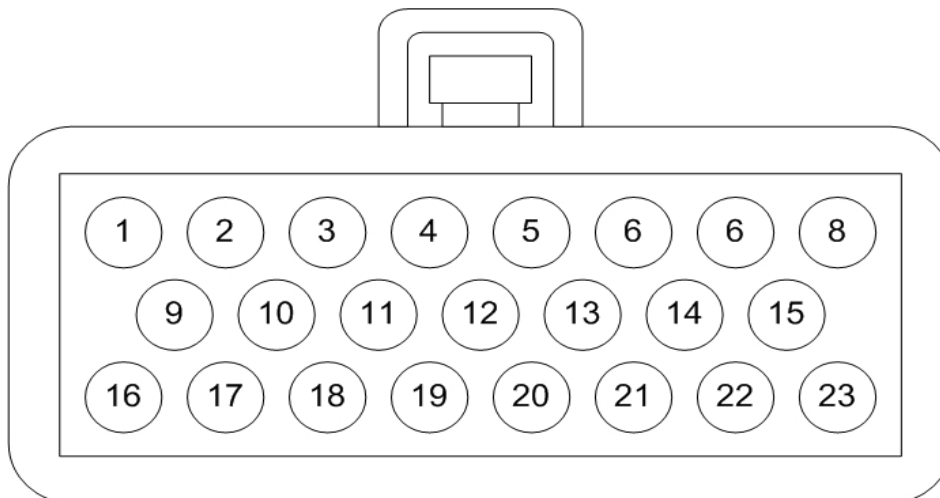
**Vibration** – One control has been subjected to the Navy Manufacturing screening program (NAVMAT – P9492) vibration test. Random vibration from 20Hz to 2000Hz for 5 minutes in each plane (X,Y,Z). The Magnitude is 20 G rms. Control properly operated after test.

**Shock** – One control was subjected to 3 pulses of 20G in each of the 3 major axis. No physical damage occurred and control properly operated after test.

**Power Cycle** – One control was operated at full current rating (50% on time) for 10 seconds and off for 40 seconds. Control completed 100,000 cycles.

<u>Function</u>	<u>Setting</u>	<u>Description</u>
1	13	MPH Scaling
2	205	Creep Speed
3	15	Controlled Acceleration
4	255	Current Limit
5	255	Plugging Current Limit
6	85	Odometer Scaling
7	78	Minimum Field Current
8	130	Maximum Field Current
9	255	Regen Armature Current Limit
10	195	Regen Field Current Limit
11	0	Not Applicable
12	100	Reverse Speed Control
13	0	Not Applicable
14	12	Battery Compensation
15	48	Battery volts
16	35	Accel Select
17	255	Not Applicable
18	100	Field Gain 2
19	50	Field Gain 1
20	120	MPH Overspeed
21	2	Field Ramp Pedal Up Regen
22	0	Not Applicable
23	10	Error Comp
24	64	Field Weakening Start
25	0	Not Applicable
26	25	Ratio
27	0	Minutes
28	0	Fault Pointer
29	0	HR 100
30	0	HR 1
117	128	Field Calibration
118	128	Field Calibration
119	128	Armature Calibration
120	128	N/A
121	0	Amphours 1
122	0	Amphours 100
123	0	Car Number
124	0	Mode Select
125	0	Miles 1
126	0	Miles 100
127	0	.1 Miles
128	0	N/A

Connections to Main Plug (23 Pin) 500 Non Programmable Controller	
PIN	MAIN PLUG INPUT/OUTPUT DESCRIPTION
1	BATTERY VOLTS FROM TOW SWITCH
2	BATTERY VOLTS FROM TOW SWITCH
3	BATTERY VOLTS FROM ACCELERATOR START
4	BATTERY VOLTS FROM FORWARD SWITCH
5	BATTERY VOLTS FROM REVERSE SWITCH
6	BATTERY VOLTS FROM KEY SWITCH
7	ACCELERATOR INPUT VOLTAGE SIGNAL
8	ACCELERATOR NEGATIVE
9	ACCELERATOR POT +5 VOLTS SUPPLY (3 WIRE
10	BACK UP ALARM AND ZERO SPEED DETECT
11	Not Used
12	N/A
13	RS232/IrDa SWITCH
14	TACHOMETER INPUT SIGNAL
15	TACHOMETER 12 VOLT OUTPUT
16	NEGATIVE FOR TACH
17	LINE CONTACTOR COIL DRIVER
18	Not Used
19	Not Used
20	Not Used
21	Not Used
22	SERIAL RECEIVE
23	SERIAL TRANSMIT

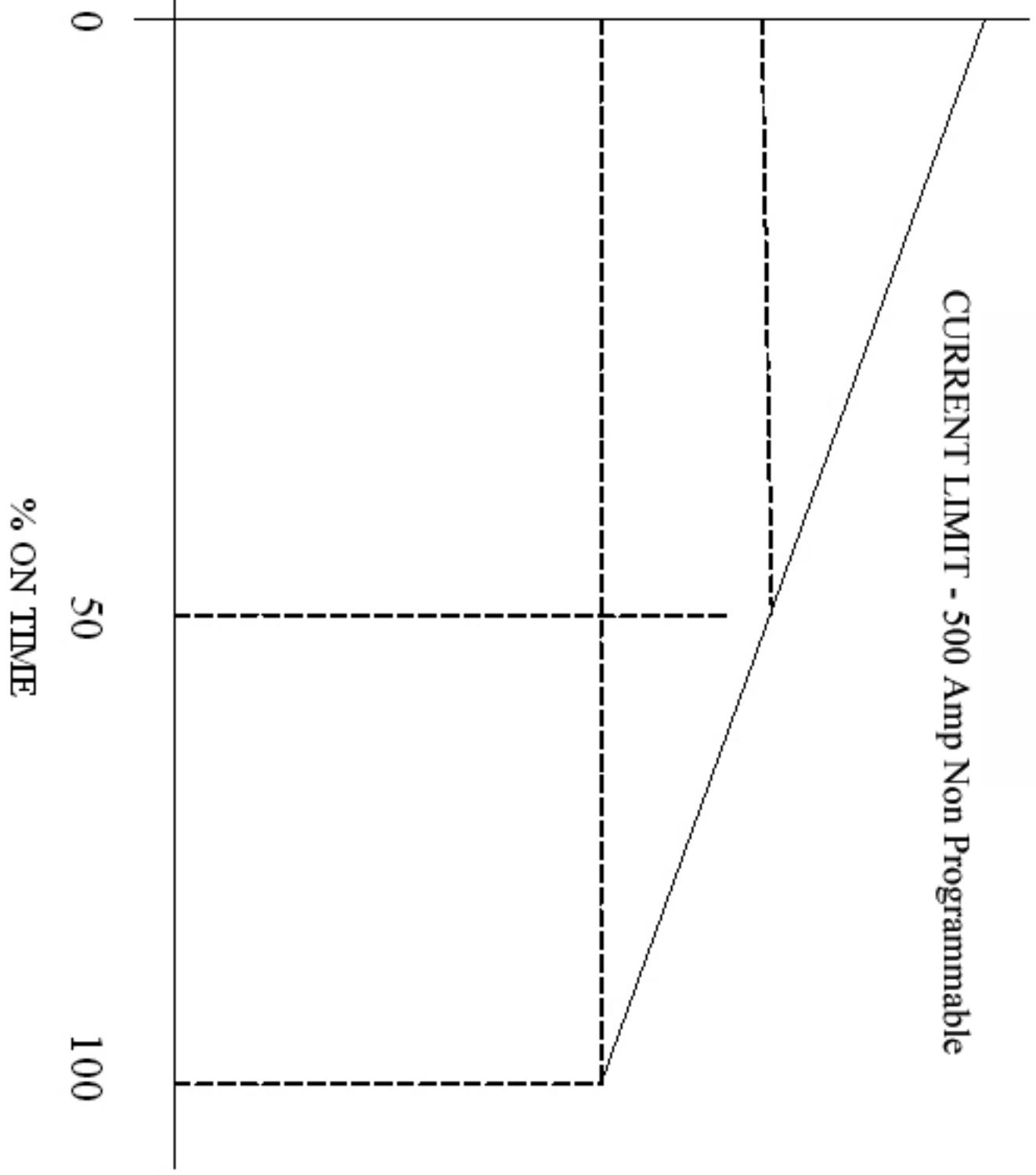


**WIRE END VIEW - MAIN PLUG**

550  
CURRENT LIMIT - 500 Amp Non Programmable

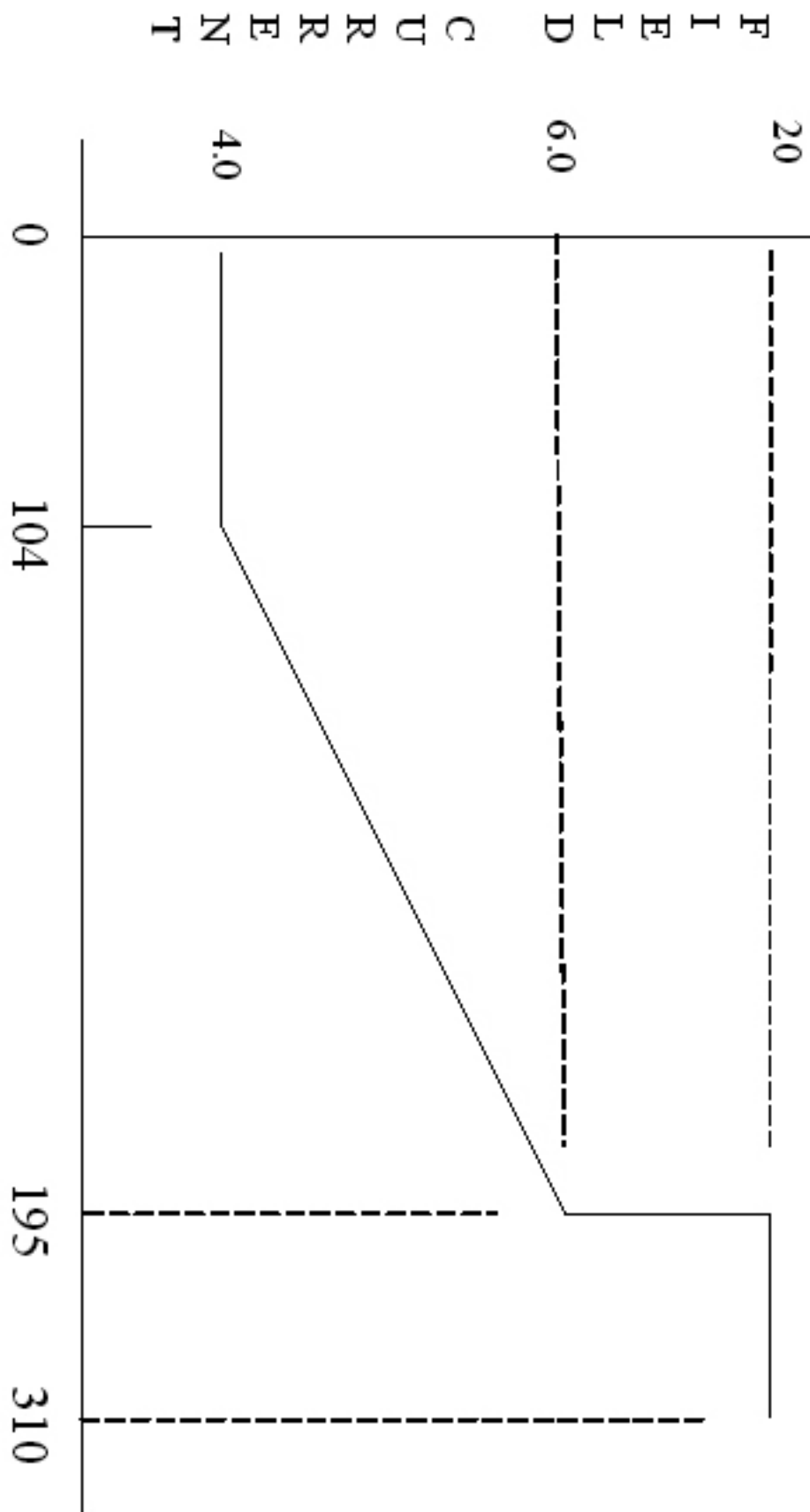
A  
R  
M  
500

C  
U  
R  
R  
E  
N  
T  
450



% ON TIME

ARM I vs FIELD I  
500 Non Programmble



ARM I

