www.Alltraxinc.com

ALLTRAX

PERFORMANCE MOTOR CONTROLLERS

Operators Manual
Toolkit Software

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WARNINGS

GENERAL WARNINGS

Safety Notes:

When working on electric vehicles, sudden unexpected events can occur, it's recommended to:

- Place the drive axle on jack stands—wheels off the floor.
- When working on wiring or batteries, always remove rings, watches and secure dangling clothing/ hair/jewelry.
- Use the proper safety equipment, eye protection, and insulated tools.
- Never connect a computer while the vehicle is being charged.
- Disconnect batteries before installing or working on the Alltrax controller.
- Wear safety glasses.
- Because hydrogen can build up due to gassing from the batteries, work in a well ventilated area.
- Make sure the battery pack is fused.
- Do not clean the controller with a high PSI pressure washer.
- When cleaning batteries, take precautions to keep the battery acid from splashing on the controller.

CAUTION:
It is the installer's responsibility to ensure the correct equipment (i.e. wire, motor, solenoid, fuse etc) is installed in the vehicle. Equipment should be sized correctly for planned usage. Failure to do so could poses a significant risk of explosion, fire, property damage and serious injury or death.

READ AND SAVE THESE INSTRUCTIONS

Terms and Definitions

IPM: *Internal Permanent Magnet*

SMPM: *Surface Mount Permanent Magnet*

KI: *Integral Gain for PI/PID controllers*

KP: *Proportional Gain for PI/PID controllers*

KD: *Derivative Gain for PI/PID controllers*

Quadrature: *Most common type of Speed Sensor Signal used in AC Induction motor applications*

Sine/Cosine: *Commonly used for speed sensors in IPM and SMPM motor applications.*

ITS: *Inductive Throttle System, used in DC EZGOs*

KSI: *Key switch input, refers to signal voltage from the KEY*

Roll Detect: *Is a feature that uses the speed sensor to determine whether or not the cart is moving with no active throttle.*

Unique Features

Low Voltage Protection -

If battery voltage falls below your set Under Voltage limit the controller will shut off the power supply completely to prevent the batteries from getting drained to the point of damaging themselves. If you plug the controller into the toolkit software you will get a large SHUTDOWN warning to notify you of what happened. You can bring power back by cycling the TOW/RUN or plugging your charger back into the cart.

Trigger Limts -

5v under shutdown triggered in 5 minutes
10v under shutdown triggered in 1 minute

PROGRAMMING THE CONTROLLER

Controllers ordered for stock configuration come pre-programmed and do not need to be programmed before use. If the user would like to customize their performance or has upgraded their motor and needs a matching motor map the controller can be connected to a computer with a USB A to B, commonly referred to as a "printer cable".

The USB A to B cable is used to connect your motor controller to your personal computer. Using the free Alltrax Toolkit you can customize your performance to match your needs.

The Alltrax Toolkit software can be downloaded from:
https://alltraxinc.com/alltrax-tool-kit/
No purchase necessary

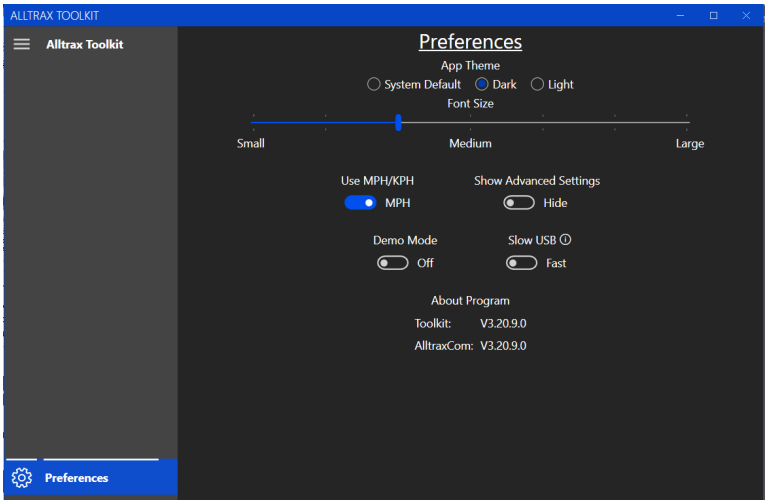
DOWNLOAD SOFTWARE

Alltrax Toolkit Software Manual

DOWNLOAD MANUAL

PROGRAMMING THE CONTROLLER

When opening the Toolkit software the program is looking for a controller, without one connected you will get a mostly blank screen. Unlike previous versions of the software you can now demo a controller if you'd like to play with the software while waiting on your new controller.



Clicking on **Preferences** will now give you some options even before a controller is connected.

App Theme: Lets you switch between 'Default', 'Light' and 'Dark modes' to make viewing easier.

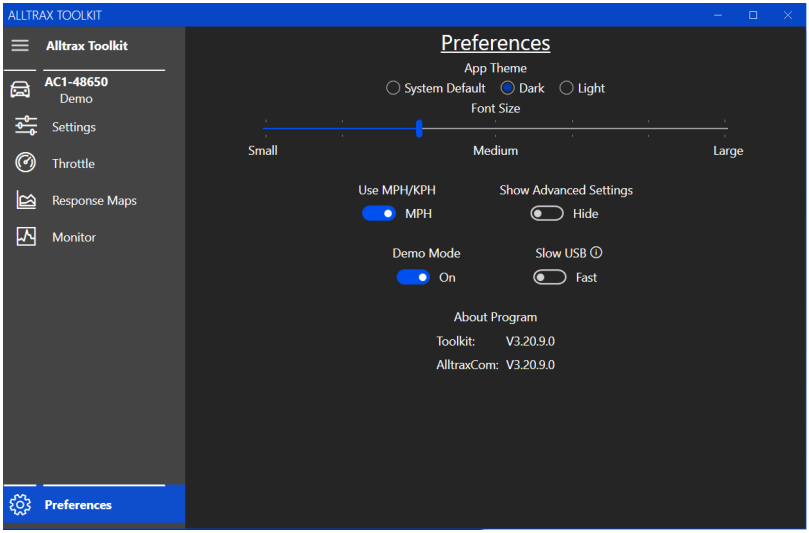
Font Size: Allows you to customize the size of font from small to large, default position shown.

Use KPH/MPH: The new toolkit can now show MPH in the monitor tab, this option allows you to choose between MPH/KPH for speed displayed in the monitor tab

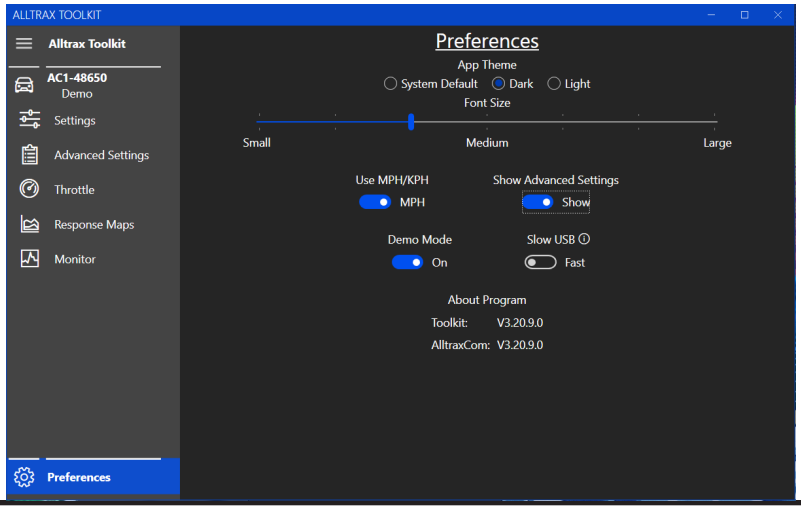
Slow USB: Slows the USB signal down, use if you have problems with crashes when changing settings.

PROGRAMMING THE CONTROLLER

Demo Mode: Selecting this makes the toolkit create a fake controller so you can try playing with the settings before getting connected to a controller. These settings will not carry over when you plug into an actual controller and are purely for demonstration purposes

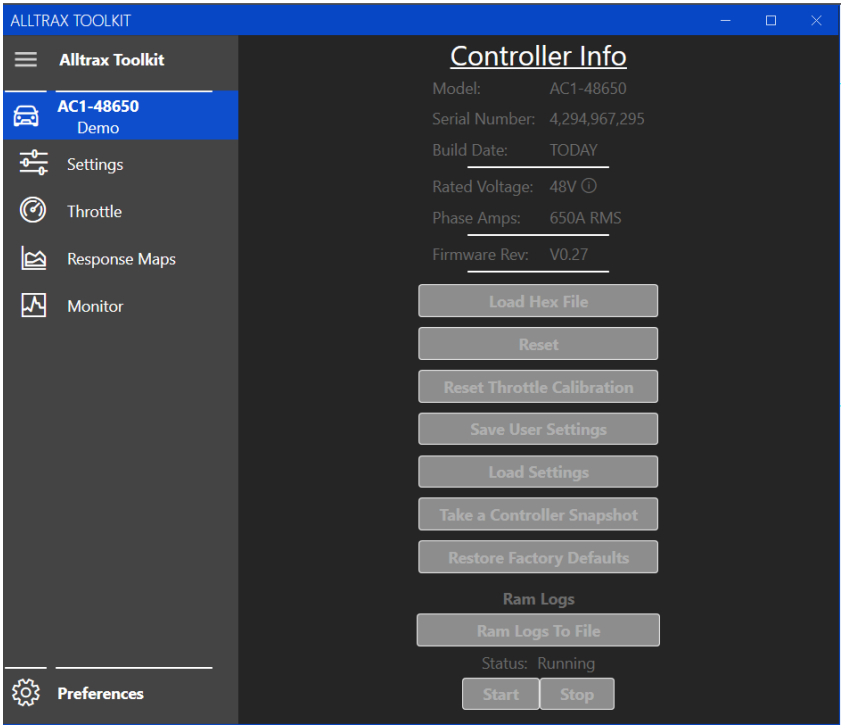


Show Advanced Settings: This is for advanced users only and we do not recommend touching it unless the car is on jack stands and you know what you're doing.



PROGRAMMING THE CONTROLLER

Controller Info



Controller Info: Displays information about the controller such as rated voltage, RMS current rating, serial number, build date and which firmware revision it is using.
Load Hex File: Use only when directed by an Alltrax rep.
Reset: Digitally kills power to the controller restarting it.
Reset Throttle Calibration: Restores factory throttle and brake calibration settings.
Save User Settings: Backup your settings to an external file.
Load Settings: Load previously saved user settings.
Take a Controller Snapshot: Creates a file that can be sent to Alltrax Tech Support which displays all of your settings.
Restore Factory Defaults: Returns all settings to default values.

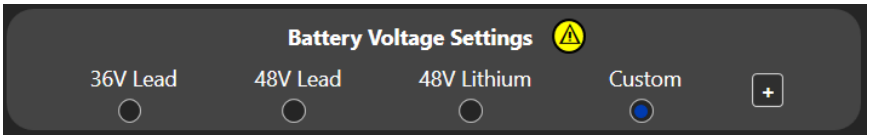
PROGRAMMING THE CONTROLLER

Controller Settings

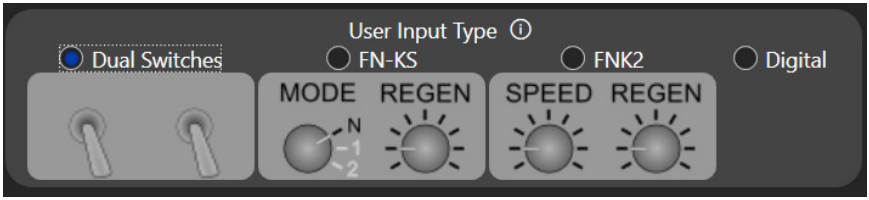
For a more thorough walk through of programming the controller see our youtube channel for the instructional video:
PUT CHANNEL NAME HERE

Potential warning symbol. We recommend hovering your cursor over it when seen.

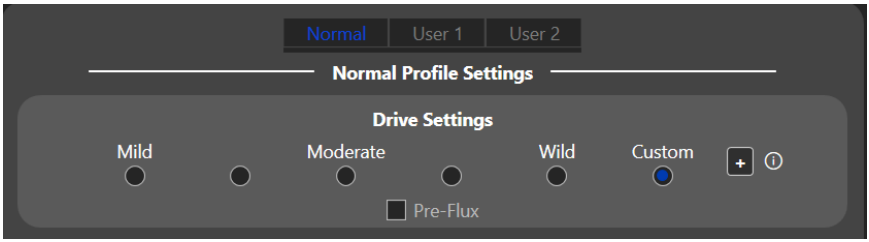
Hovering your mouse over this symbol will give you a description of the setting/option.



General voltage settings for stock applications. Clicking the plus symbol allows you to fully customize these settings.



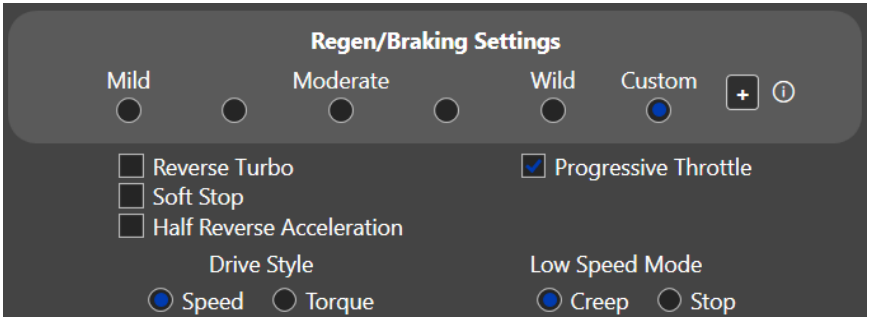
User Input Type allows you to select which Alltrax FN control you're using with the controller. Dual Switch is the default and should be used if you DO NOT have an FN box.



If you're using an FNKS you can set up three performance profiles, otherwise NORMAL is the only profile that will affect you.
Drive Settings: Allows you to choose your level of performance using Alltrax's pre defined settings. Custom auto selects when you click the plus sign and start manually fine tuning the advanced sliders.

PROGRAMMING THE CONTROLLER

Controller Settings *continued*



Regen Braking Settings allow you to pick from pre defined braking ratios. You can customize them to fit your personal preference by clicking on the plus sign and adjusting the sliders.

Reverse Turbo: Allows turbo to activate in reverse

Soft Stop: When regen braking, it prevents a sudden hard jerk as you come to a complete stop.

Progressive Throttle: Can help smooth out rough throttles and tone down initial take off speed.

Half reverse Acceleration: Lower acceleration speeds in reverse only

Drive Style: Determines how throttle is applied.

Speed: Speed is directly related to pedal press

Torque: Pedal press determines applied torque, speed is determined by user settings. So 50% pedal is 50% applied torque rather than 50% applied speed.

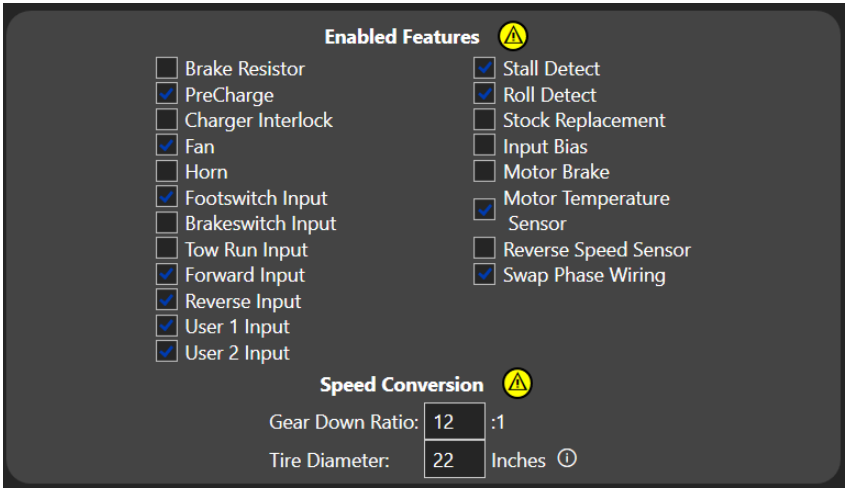
Low Speed Mode: Determines how zero throttle is handled.

Creep: Allows the cart to creep to halt when at 0 throttle

Stop: Keeps the cart locked in place when at 0 throttle. Requires motor brake to function.

PROGRAMMING THE CONTROLLER

Controller Settings *continued*



Brake Resistor: Currently only used with EZGO RXVs

Pre Charge: Determines if the controller is looking for Pre Charge

Charge Interlock: Can look for an interlock signal from charger

Fan: Turn the fans off/on

Horn: Some AC cars won't work with a disconnected horn

Footswitch Input: Enable/Disable footswitch signal

Brakeswitch Input: Enable/Disable required brakeswitch signal

Tow/Run Input: Whether or not you have a Tow/Run switch

Forward Input: Default forward if you have no 'Forward' pin

Reverse Input: Allows controller to respond to reverse input

PROGRAMMING THE CONTROLLER

Controller Settings *continued*

User 1 Input: Controller will respond to voltage input from User 1 connection of the harness

User 2 Input: Controller will respond to voltage input from User 2 connection of the harness

Stall Detect: Can be disabled for testing purposes

Roll Detect: Enable/Disable Roll Detect

Stock Replacement: Controller mimics stock performance

Input Bias: Determines Hi/Lo ground bias

Motor Brake: Used in applications with a motor brake (RXV)

Motor Temp Sensor: Checked when using a temp sensor

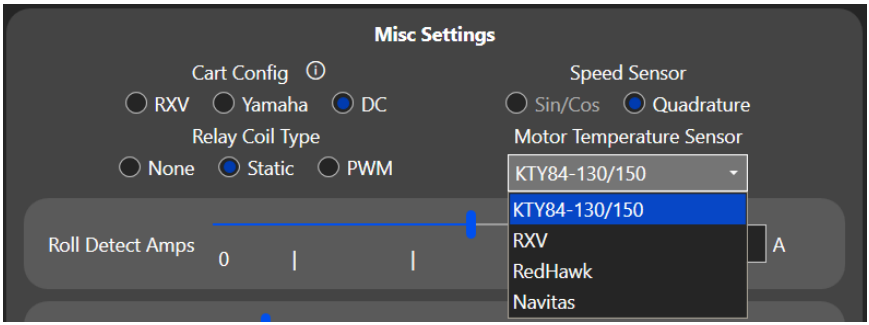
Reverse Speed Sensor: Reverse the direciton the motor thinks it is spinning as it can be installed in either orientation.
****Never do this unless the Key is OFF and the vehicle is NOT moving****

Swap Phase Wiring: Allows controller to swap phase wiring internally.
****Never do this unless the Key is OFF and the vehicle is NOT moving****

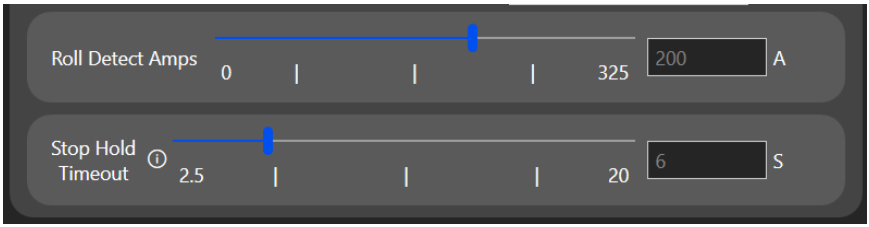
Speed Conversion: Uses tire height and gear ratio to determine MPH

PROGRAMMING THE CONTROLLER

Misc Settings



Cart Config: Defines the controllers response changes and start up sequence. Not all carts are the same and this setting should match your application.
Relay Coil Type: Tells the controller what style of Relay/Main Contactor you're using or if you're using one at all. A relay is required for most applications.
Speed Sensor: Selects between Sine/CoSine and Quadrature speed sensor types. IMP and SMPM motors tend to be the only ones using Sin/Cos speed sensors
Motor Temperature Sensor: Tells the controller which style of speed sensor you are using.



Roll Detect Amps: The amperage used to stop the cart when the controller senses wheel speed with no pedal activated.
Stop Hold Timeout: The way this affects you depends on if you have a motor brake and if you have regen set for 'stop mode'.
It is the amount of time roll detect will hold you stopped before engaging the motor brake or allowing you to creep forward again.

PROGRAMMING THE CONTROLLER

Misc Settings

Active Logic

Active Logic
refers to the controllers ability to respond to either Hi or Lo voltage signal inputs from the cart.

Key Switch: Determines if the controller responds to positive (Hi) or ground (Lo) control voltage from the Key.

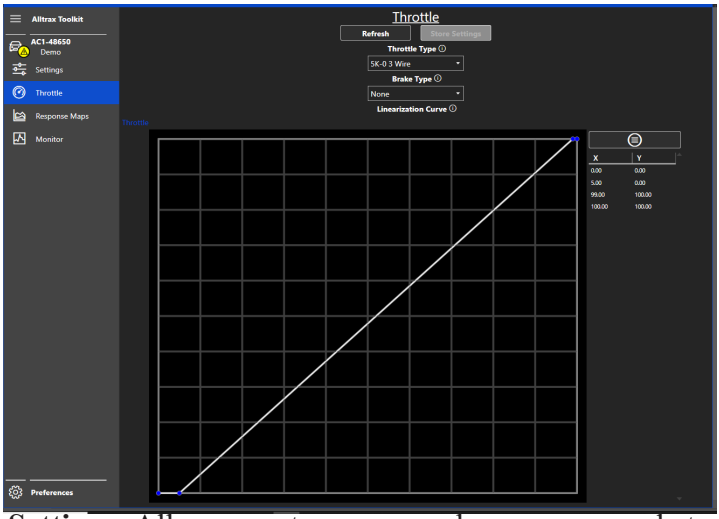
Forward: Determines if the controller responds to positive (Hi) or ground (Lo) control voltage from the Forward Reverse switch - forward side.

Reverse: Determines if the controller responds to positive (Hi) or ground (Lo) control voltage from the Forward Reverse switch - reverse side.

Foot Switch: Determines if the controller responds to positive (Hi) or ground (Lo) control voltage from the “foot switch” in your throttle.

PROGRAMMING THE CONTROLLER

Throttle Settings



Store Settings: Allows you to save any changes you made to the throttle curve graph. Can be loaded again later or into separate controllers.

Throttle Type: Drop down menu which allows you to select from various stock and aftermarket throttle types.

USB Throttle: This allows you to control the system using your computer as a throttle rather than the one in the car. Good for testing purposes

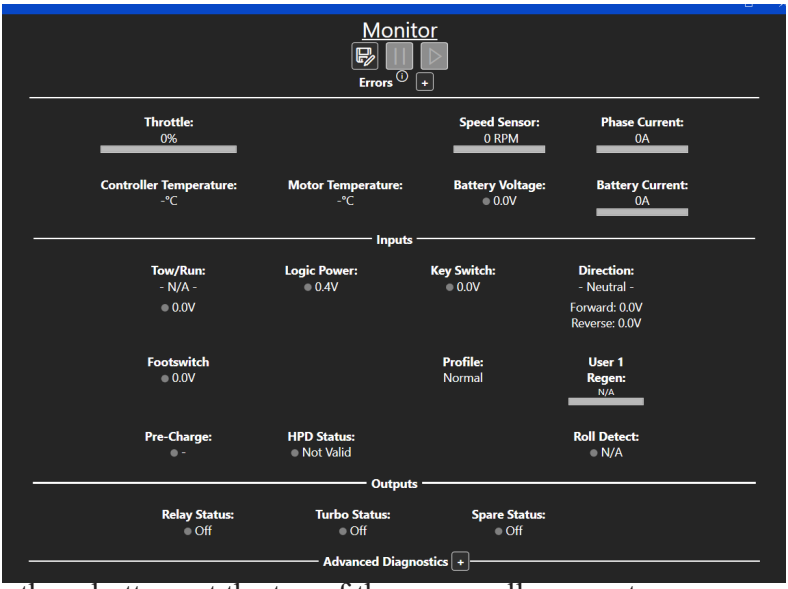
Absolute Throttle: Used for custom throttle applications.

Brake Type: Allows you to select from all the available brake styles, mainly used for the RXV and custom applications with an electric motor brake.

Throttle Graph: You can use this graph to linearize your throttle input. To add a point to the graph simply double click on anyspot of the curve, you can then move the points around and reshape the curve to your needs. The X/Y axis can be displayed on the right or hidden from view.

PROGRAMMING THE CONTROLLER

Monitor Functions



The three buttons at the top of the screen allow you to save your monitor log to a file, Pause recording and Start recording.

Errors: Error flags will only appear when the problem occurs now. If you'd like to see them all the time you can click the plus sign beside ERRORs to reveal them.

Displayed below errors and above inputs is your voltage/amperage information for the high current circuit as well as RPM, MPH and temperature.

Inputs: For the inputs section the new toolkit software can not only tell you if something is on or off but tell you the actual voltage being used.

Outputs: Displays relay status and whether or not turbo is active

BLINK CODES

On power up, the controller will blink out a throttle code and then a Status or Error Code (see below)

Throttle Type Codes:

1 Green LED Flash	=	2-wire 0-5k throttle
2 Green LED Flash	=	2-wire 5K-0 throttle
3 Green LED Flash	=	0-5V throttle
4 Green LED Flash	=	EZGO ITS throttle
5 Green LED Flash	=	3-wire 0-5k
6 Green LED Flash	=	6 to 10.5 Taylor Dunn throttle
7 Green LED Flash	=	MCOR
8 Green LED Flash	=	Reserved
9 Green LED Flash	=	Pump
10 Green LED Flash	=	USB Throttle
11 Green LED Flash	=	Absolute Throttle
12 Green LED Flash	=	PWM_Throttle

Brake Type Codes:

1 Green LED Flash	=	2-wire 0-5k throttle
2 Green LED Flash	=	2-wire 5K-0 throttle
3 Green LED Flash	=	0-5V throttle
4 Green LED Flash	=	Reserved
5 Green LED Flash	=	3-wire 0-5k
6 Green LED Flash	=	6 to 10.5 Taylor Dunn throttle
7 Green LED Flash	=	MCOR
8 Green LED Flash	=	Reserved
9 Green LED Flash	=	Reserved
10 Green LED Flash	=	USB Throttle
11 Green LED Flash	=	Absolute Throttle

BLINK CODES

Normal Display Status:

Solid Green Light	=	Controller Ready to Run
Solid Red Light	=	Controller in programming mode
Solid Yellow Light	=	Throttle is wide open and the controller is NOT in Current Limit
Blinking Yellow Light	=	Throttle is wide open, but the controller is in Current Limit

Error Codes:

AC alarm codes flash a sequence of green then red. All alarms are self clearing and will repeat until the error condition has been corrected.

1 Green and 1 Red LED Flash	=	Short Circuit/Output Fault
1 Green and 2 Red LED Flash	=	Battery Under Voltage
1 Green and 3 Red LED Flash	=	Battery Over Voltage
1 Green and 4 Red LED Flash	=	Over temperature
1 Green and 5 Red LED Flash	=	Throttle Power Fault
1 Green and 6 Red LED Flash	=	Pre-Charge Failure
2 Green and 1 Red LED Flash	=	Throttle/Brake Range
2 Green and 2 Red LED Flash	=	Bad Variables
2 Green and 3 Red LED Flash	=	High Throttle Over range
2 Green and 4 Red LED Flash	=	High Throttle Under range
2 Green and 5 Red LED Flash	=	Low Throttle Over range
2 Green and 6 Red LED Flash	=	Low Throttle Under range
3 Green and 1 Red LED Flash	=	Throttle/Brake Range
3 Green and 2 Red LED Flash	=	Bad Variable Set Loaded
3 Green and 3 Red LED Flash	=	Relay Coil Overcurrent
3 Green and 4 Red LED Flash	=	Brake Coil Overcurrent
3 Green and 5 Red LED Flash	=	Reserved Overcurrent*
3 Green and 6 Red LED Flash	=	Horn Overcurrent
4 Green and 1 Red LED Flash	=	Reserved
4 Green and 2 Red LED Flash	=	Reserved
4 Green and 3 Red LED Flash	=	Hardware Failure
4 Green and 4 Red LED Flash	=	Startup Failure
4 Green and 5 Red LED Flash	=	Reserved
4 Green and 6 Red LED Flash	=	Reserved
5 Green and 1 Red LED Flash	=	General Error

CODE DEFINITIONS

Error Code Definitions:

• Short Circuit/Output Fault:
Controller detected a short circuit or other fault on the output circuit. Check wiring.

• Battery Under Voltage:
B+ Voltage lower than Low Voltage Battery Setting. Check pack voltage or program settings.

• Battery Over Voltage:
B+ Voltage Higher than Over Voltage Battery Setting. Check pack voltage or program settings

• Over temperature:
Busbar temperature exceeds 90^{o}C. Let controller cool and/or add fan.

• Throttle power Fault:
This is a 5V fault, if the speed sensor gets damaged this alarm will be one of the alarms triggered. Can also be caused by a fault in voltage based throttles

• Pre-charge Failure:
B+ voltage and KSI voltage differ by more than 5v. Stuck solenoid.

• Under Temp:
Busbar Temperature reads less than -20^{o}C

• High Throttle Over range & High Throttle Under range:
High Side of throttle signal is outside of acceptable window for that throttle type. Check and/or replace throttle. Change throttle type to correct throttle installed on car.

• Low Throttle Over range & Low Throttle Under range:
Low Side of throttle signal is outside of acceptable window for that throttle type. Check and/or replace throttle. Change throttle type to correct throttle installed on car.

• Bad Variable Set Loaded:
Alltrax loaded variable data is missing or corrupted. Contact Alltrax

• Throttle/Brake Range:
The RXV has a “throttle” built into the brake pedal to communicate with the motor brake. This alarm indicates an error in that signal.

CODE DEFINITIONS

Error Code Definitions:

• Relay coil overcurrent:
Relay coil has shorted, the wires were attached incorrectly or the suppression control diode is backwards.

• Brake coil overcurrent:
Short in the brake pedals resistor coil. Presently this can only trigger on EZGO RXV applications

• Horn Overcurrent:
There is a short in the horn circuit, could be wiring or horn related

WARRANTY STATEMENT

Alltrax, Inc., (hereafter Alltrax) warrants that the product purchased is free from defects in materials or workmanship for a period of 2 years from the date of manufacture. This warranty does not apply to defects due directly or indirectly to misuse, abuse, negligence, accidents, repairs, improper installation, submersion, alterations or use contrary to any instructions provided by Alltrax in verbal or written form.

In the event you should need warranty repair, contact Alltrax at (541) 476-3565 to receive warranty service authorization instructions for returning the defective product to Alltrax for evaluation. Products or parts shipped by customer to Alltrax must be sent postage paid and packaged appropriately for safe shipment. Alltrax is not responsible for customer products received without warranty service authorization and may be rejected.

Alltrax reserves the right to repair or replace merchandise at its option at no cost to the customer, except for shipping costs of sending the defect item to Alltrax. Replacement shall mean furnishing the customer with a new equivalent product to the defective item. Alltrax also reserves the right to make changes to any of its products or specifications without notice.

Alltrax assumes no liability for applications assistance or customer product design. Customers shall be responsible for evaluating the appropriateness of the use of any Alltrax product in any application. Customers shall provide adequate design and operating safeguards that are in compliance with standard practices of other similar applications or any standards of any governing agency.

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“Thank you Nikola Tesla, for a better motor”