

Navitas Vehicle Systems Ltd.

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**NAVITAS TAC 1.0**  
**600A 48-72V CONTROLLER**  
for  
**AC INDUCTION MOTORS**

Installation/Service Manual



INSTALLATION INSTRUCTIONS FOR:  
**E-Z-GO®RXV® 48V (CURTIS®)**  
**E-Z-GO® RXV® 23 48V (DANAHER®)**  
**E-Z-GO® TXT® 48 Conversion**  
**CLUB CAR® Precedent® Conversion**

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**NAVITAS**

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## **BEST PRACTICES**

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### **Hill Descent**

- To maximize your vehicle's driving range only use the speed you need if using the OTF
- Use the speed knob to control your maximum cruising speed, turn the speed down to the minimum practical speed necessary for the application. The controller significantly increases the operating efficiency of the motor as the maximum speed adjustment is reduced.
- Minimize acceleration - hard acceleration demands high in-rush currents from the battery pack. This increases wear and tear on both the motor and the mechanical systems.

### **Hill Descent**

- Use regenerative braking for hill descent - it puts energy back into the battery and it increases the life of your brakes. regenerative braking can be applied gradually and can reduce the likelihood of losing traction when going down a hill.

### **Motor Overheating**

- If you observe the motor temperature warning (1-4 flash) the controller has reduced the power going to the motor. Stop and let the motor cool down. The system will reset automatically.
- If you cycle the key, it will temporarily override the power cutback but can lead to motor damage if it is done continuously.

### **Low Battery Warning**

- When the battery discharged warning (1-5 flash) is given by the OTF (if present), the controller will reduce the amount of power it supplies to the motor to protect the motor.
- Cycling the key will reset full controller power for 1 minute but doing so repeatedly will adversely affect the life of your motor. Recharge the batteries as soon as possible.

### **Motor Stability Concerns**

- In rare instances some brands of motors may exhibit hunting, pulsing or other symptoms of instability at or near the maximum speed setting of the OTF programmer. We recommend that you reduce the maximum speed setting until the motor operates in a stable mode. Then mark that position on the OTF speed dial label to indicate the maximum stable speed setting for that particular motor.
- Retest the motor to ensure that it is not becoming too hot to touch otherwise further reduce its maximum speed.

### **Heavy Duty Usage**

- If you notice that your motor or cables are becoming too hot to touch, then your application is probably too demanding and we recommend that you upgrade the motor to a speed/torque system, and upgrade the cables to at least 4 AWG.

### **Warnings**

- Always monitor the motor & battery wiring temperatures after changing the programmer settings (if OTF is present) – particularly when going to higher speeds
- If your battery pack is full, the amount of regenerative braking is reduced since the controller has nowhere to put the excess energy.

## INTRODUCTION

### NAVITAS TAC 1.0 48-72V 600A Controller AC INDUCTION MOTOR CONTROLLER

- The owner, and all vehicle operators MUST read and understand all warnings and instructions in this manual and in the Vehicle Owner/Operator's Manual. The owner of this vehicle assumes all liability for accidents, injuries or damages if the warnings and instructions are not followed.
- Navitas Vehicle Systems Ltd. assumes no responsibility for errors or omissions in this manual, in regards to liability or damages resulting from the use of information contained in the manual. If it is lost or damaged please contact your local dealer.
- Navitas Vehicle Systems Ltd. reserves the right to make changes to the controller, parts of the controller, accessories, labelling or instructions without obligation to make these changes on units previously sold.
- Product and specifications are subject to change without notice or obligation.

**ATTENTION:**

- BEFORE INSTALLING THIS CONTROLLER PLEASE RECORD THE SERIAL NUMBER LOCATED ON THE BODY OF THE CONTROLLER.

PART	SERIAL #
RXV TAC 1.0 600A 48-72V CONTROLLER W/BT 10-000688	
RXV23 1.0 600A 48-72V CONTROLLER W/BT 10-000750	
TXT 1.0 600A 48-72V CONTROLLER W/BT 10-000757	
CLUB CAR 1.0 600A 48-72V CONTROLLER W/BT 10-000757	



**Wear Eye Protection!**

**SAFETY WARNINGS****DANGER**

FAILURE to follow the WARNINGS below can damage the Vehicle and/or cause SERIOUS INJURY OR DEATH!

**MAKE SURE TO READ and UNDERSTAND the OWNER'S INSTALLATION and SERVICE MANUAL and ALL WARNING LABELS with this Controller.**

Make sure to also Read, Understand, and follow the Vehicle's OWNER'S MANUAL and ALL INSTRUCTIONS and WARNING LABELS.

- Always proceed with caution. Keep speed low and do not drive faster than conditions permit. Terrain, conditions, and the operator's skill will determine a safe speed. Avoid sharp turns and do not accelerate quickly when turning as this can cause the vehicle to slide sideways or skid out of control. Abrupt manoeuvres or aggressive driving can cause a rollover even on flat open areas.
  - This controller will increase torque, but DOES NOT increase the GVWR (Gross Vehicle Weight Rating), cargo capacity, or towing capacity of the vehicle. Always follow the vehicle towing and loading specifications.
- 
- Do not leave children or pets unattended in or near the vehicle. Always look behind you before and while backing up.
  - Reduce speed when towing and allow more room for stopping and turning.
  - Drive with wheels straight when going up and down hills. Slow down and use brakes when going down hills.
  - Never drive on hills with a slope greater than 15 degrees.
  - Do not drive through fast flowing water or water above the floor of the vehicle.
  - If you must cross shallow water, make sure to stop and inspect the area for sudden drop-offs, large rocks or slippery surfaces. Always proceed with caution or choose a safer route.
  - When towing this vehicle make sure the key is turned off, the **Run/Tow** switch is in **Tow**, and batteries main power is disconnected.
  - Never exceed the towing capacity rating as specified by the vehicle manufacturer.
  - Never re-wire, by-pass or change the wires, switches, or controller. Contact your dealer if vehicle is not operating correctly.
  - Keep the controller and the area around it clean and free of debris. Keep electrical components dry and DO NOT wash with direct stream or power washer
  - Driver must be a minimum of 16 years of age with a current driver's license, or be accompanied by a parent or legal guardian when operating the car.
  - Modifying motor controller parameters may change vehicle acceleration, braking and top speed behavior. Please verify vehicle performance before the use and obey federal, county and municipality bylaws and regulations.
  - Product use is for golf car and Low Speed Vehicle (LSV) market application and may operate at speeds Up to 25 MPH. Factory settings on controller have been set using: 18 inch diameter tires, non-performance motor & up to 25 MPH limit with vehicle speed sensor installed.
  - Operators/Users of Navitas golf car and LSV equipped products must follow published golf car & LSV federal, state, county & municipal bylaws & regulations issued for your "use area". For operation/use beyond golf car & LSV regulations/guidelines, full liability is assumed by operators/users.
  - Do not drive vehicles while influenced by alcohol, medications & drugs as this may/will impair your safe driving use.
  - User to verify that golf car & LSV vehicle mechanical brakes are fully functional prior to continued operation of vehicle.
  - Vehicle & all parts must be serviced by qualified service personnel. For an authorized service location see your local dealer or visit our web site at [www.NavitasVS.com](http://www.NavitasVS.com).

## AC CONTROLLER PARTS LIST

**Confirm that all parts listed below are with your kit before starting installation.  
If you are missing parts please contact your local dealer.**

<b>AC Induction Kit-Curtis 1236 E-Z-GO RXV 10-000749</b>	
PART DESCRIPTION	QTY
TAC Controller 600A	1
TAC Harness for RXV (Curtis)	1
TAC RXV Mounting Plate Kit	1
OTF 1.0 Programmer	1
Cable for-RXV	1

<b>AC Induction Kit-Danaher E-Z-GO RXV23 10-000750</b>	
PART DESCRIPTION	QTY
TAC Controller 600A	1
TAC Harness for RXV23 -Danaher	1
TAC RXV23 Mounting Plate Kit	1
OTF 1.0 Programmer	1
Cable for-RXV 23B	1
Wiring for RXV23 resistor	1

<b>TAC-IQ PRECEDENT 10-000747 (not released)</b>	
PART DESCRIPTION	QTY
TAC Controller 600A	1
TAC Harness for IQ	1
TAC IQ Mounting Plate Kit	1
OTF 1.0 Programmer	1
AC Motor 5KW 34V 10T Green	1
AC Motor Adapter	1
Cable for TAC-TXT/IQ - Speed Sensor / Motor Temperature	1

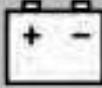
<b>EZ-GO TXT 10-000748</b>	
PART DESCRIPTION	QTY
TAC Controller 600A	1
TAC Harness	1
TAC TXT Mounting Plate Kit	1
OTF 1.0 Programmer	1
AC Motor 5KW (Navitas)	1
AC Motor Adapter	1
Cable for TAC-TXT/IQ - Speed Sensor / Motor Temperature	1
Run/Tow Switch Mounting Plate	1

## INSTALLATION INSTRUCTIONS



### ATTENTION:

- Before installing the controller make sure that the golf car's electrical system is working properly.
- All components such as the motor, Run/Tow switch, pedal cluster, FWD/REV switch and all wiring needs to be in good condition and operating to manufacturer's standards.
- The batteries must be in good condition and each battery must hold a charge!
- If the system is not working properly this must be repaired before installing this controller!



### DANGER

FAILURE to follow the WARNINGS below can damage the Vehicle and/or cause SERIOUS INJURY OR DEATH!

**Installation or Servicing of the NAVITAS 600A 48-72V Controller must be done by a trained golf car technician. Before installing or servicing of the NAVITAS Controller:**

- Make sure the **Run/Tow** switch is in the **Tow** position
- The Key is turned OFF and removed from the ignition
- The parking brake is engaged
- Before testing the controller/vehicle make sure ALL four wheels are off the ground and supported with jack stands.
- The area around the vehicle must be clear. Keep all people, children and pets away from the vehicle when installing, servicing or testing the vehicle.
- Read NAVITAS 600A 48-72V Controller Installation/Service and all warning labels before servicing or troubleshooting this Vehicle.
- The controller is sealed and cannot be opened for service. To replace the controller call your local dealer. Opening the controller will void the warranty
- Wear safety glasses and gloves when installing this controller.
- Wear a safety shield when working in or near the vehicle battery compartment.
- Use insulated tools to protect from electric burns.
- Never lay or put down tools in the vehicle battery compartment.
- Disconnect the main (+) positive and (-) negative cable on the vehicle's battery system.
- Remove pre-charge resistor from contactor and discard.

## INSTALLATION INSTRUCTIONS

### REQUIRED TOOLS & PARTS



#### REQUIRED TOOLS

- #3 Phillips screwdriver
- 11mm wrench
- Socket driver w/ extension
- Wire cutters
- Assorted socket set
- Safety glasses
- Flashlight (optional)



**Wear Eye Protection!**



#### PURCHASED PARTS

- 600 Amp Controller w/ Bluetooth
- Connector Cable
- Mounting Plate w/ hardware
- On-The-Fly Programmer

ALL	6 mm Bolt	60 in-lbs/ 5 ft-lbs/ 6.8 Nm
Battery	5/16 Thread	90 in-lbs



## CAUTION

**Disconnect all batteries before beginning installation. If the car has a Run/Tow switch, you must place the switch in the TOW position first!**

## INSTALLATION INSTRUCTIONS

### RXV Installation



## CAUTION

Disconnect all batteries before beginning installation. If the car has a Run/Tow switch, you must place the switch in the TOW position first!



#### PARTS

- AC kit with 600 amp controller
- Harness
- Mounting plate & hardware
- On-The-Fly programmer
- B+ cable (for solenoid to controller)

#### 1. Power down

- Turn off key, disconnect battery
- Put car on a stand and block wheels
- Use insulated tools
- Never use battery as workbench

#### 2. Remove controller cover

- Remove the battery positive bus bar
- Remove resistor wires
- Remove battery negative cable
- Remove resistor cage with solenoid
- Remove harness wires
- Remove motor phase cables



#### 3. Remove Controller

#### 4. Install plate

- Insert stands (with bolts) into floor board; front stand may need to be screwed through floor
- Add nut, washer and lock washer underneath floor board; leave nuts loose underneath
- Insert stabilizer stand (without bolts) at the bottom of the plate; tighten with bevelled screw from on top of the plate
- Add plate on to stands; tighten it down from the top and from underneath (note position plate so the end with 4 holes points towards front of car)
- Tighten plate from underneath car

#### 5. Mount Controller

- Insert lock washer and washer into corners of plate; leave loose
- Slide in controller under washers
- Tighten washers to secure controller

## INSTALLATION INSTRUCTIONS

### RXV Installation cont'd

#### 6. Connect Controller

- Route motor cables to new controller
- Remove bolts, washer, lock washer from top of new controller
- Connect cables using bolts, washers and lock washers: U to u, V to v, W to w
- Fasten NEW battery positive cable (B+ going to from controller to solenoid)
- Re-fasten resistor cage with solenoid mounted on it.
  - Use supplied bolt, washer, lock nut (or Ny-Lock nut) using original mounting holes; tighten using wrench on back side to fasten resistor cage back to its position
- Add battery positive cable onto solenoid and add black lead from resistor on top of battery cable
  - Tighten w/ 13mm wrench or socket
  - Tighten back positive terminal
- Add red wire from the resistor to the “resistor output” of the controller
  - Tighten w/ 10mm wrench or socket
- Connect battery negative cable
  - Tighten w/ 10mm wrench or socket

#### 7. Install RXV adapter harness

- Insert RXV adapter harness into controller; push tab to lock “click” connector
- Insert harness into original controller connector
- Programming end of Curtis harness will NOT be used
- Zip tie to resistor cage mount
- Re-connect cover

#### 8. Install On the Fly Programmer (Optional)

- Unclip the three nuts to remove cup holders
- Feed end of cable through body hole on the dash and leave enough slack to mount the OTF on the dash
- Mount on On-the-Fly programmer on the dash w/ Velcro strap
- Feed the cable back through the channel to the floor and chase back following wiring harness to the Navitas adaptor harness and connect it. Zip tie cable to the factory wiring harness
- Connect OTF programming end into the Adaptor harness, and connect original controller harness into Adaptor harness;
- Zip tie motor phase wires to resistor cage
- Original communication plug from OEM controller not used
- Re-Connect cover
- Mount OTF on the dash
- Re-power the system by Connecting battery connection

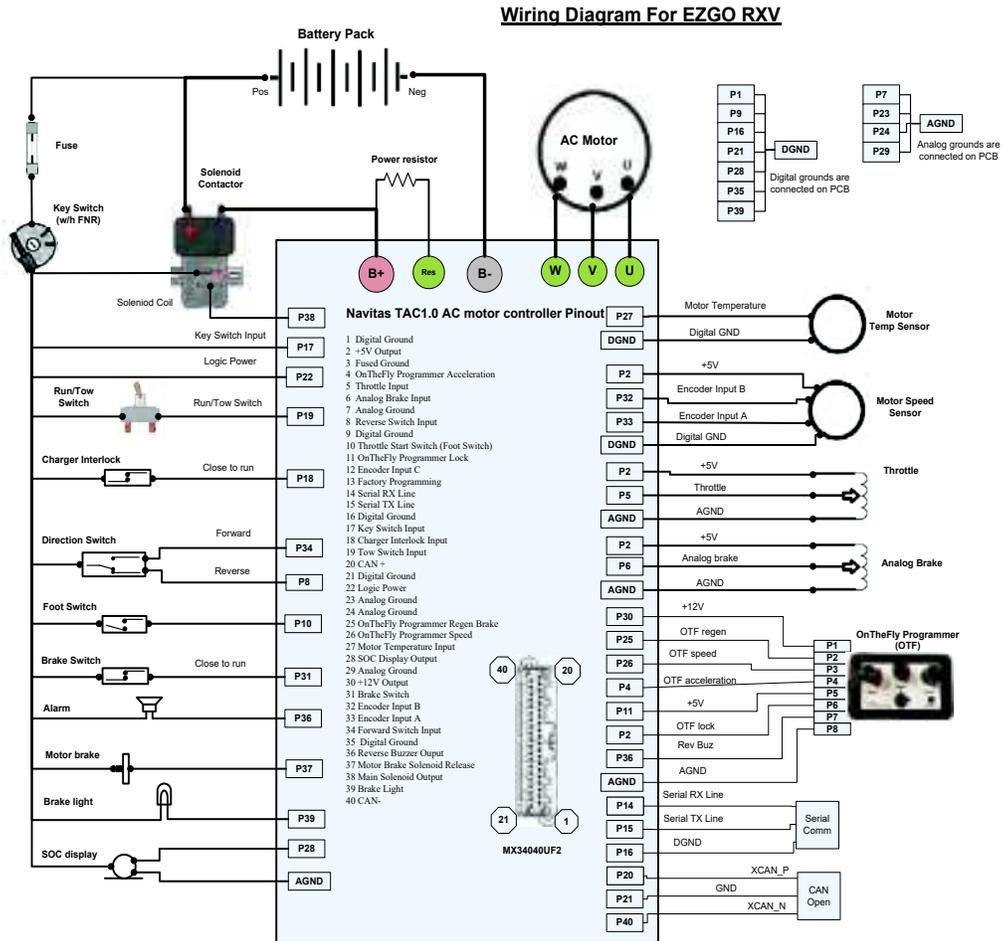
#### 9. Test installation

- Lift drive wheels off ground
- Reconnect battery pack
- Switch to **Run** mode
- Turn key to **Forward**
- Press on throttle to activate wheels

# INSTALLATION INSTRUCTIONS

## RXV Installation

### Pinout for Controller



Wiring Harness Pinout Diagrams and other updates available at:  
[NavitasVS.com/support](http://NavitasVS.com/support)



## INSTALLATION INSTRUCTIONS

### RXV 23 (Danaher) Installation



## CAUTION

Disconnect all batteries before beginning installation. If the car has a run/tow switch, you must place the switch in the TOW position first!

#### Parts:

- AC Navitas controller with Bluetooth
- Navitas adaptor harness for RXV 23 (Danaher),
- On-The-Fly programmer (optional)
- B- battery cable
- Mounting plate and hardware
- Resistor wire (longer for replacement)



#### 1. Power down

- Turn off key, disconnect battery
- Put car on a stand and block wheels
- Use insulated tools
- Never use battery as workbench

#### 2. Remove Controller Cover

- Remove solenoid (keep wires connected)
- Remove resistor cage
- Remove motor phase cables and resistor cable, B- cable from controller
- Unclip Harness wires



#### 3. Remove Controller

- Remove plate (along with Danaher controller and black resistor module and wires)

#### 4. Install plate

- Insert 3 stands (with bolts) into floor board; and insert the stabilizer stand (without bolts) onto the bottom of plate.
- Add nut, washer and lock washer underneath floor board; leave nuts loose underneath
- Add plate on to stands; align with the Solenoid Bolts to fit through 90 degree upright of plate. Tighten it down from the top and from underneath (note position plate so the end with 4 holes points towards front of car) and the top left hole beside where Solenoid is to be re-mounted.
- Tighten plate from underneath car

## INSTALLATION INSTRUCTIONS

### RXV 23 (Danaher) Installation cont'd

#### 4. Mount Controller

- Insert lock washer and washer into corners of plate; leave loose
  - Slide in controller under washers
  - Tighten washers to secure controller

#### 5. Connect Controller

- Replace existing resistor cable (with NEW included longer resistor cable) to resistor output on controller
- Refasten resistor cage and solenoid
- Connect NEW longer battery B- cable from battery pack to controller
- Connect motor phase cables (U,V,W)
- Connect battery to B+ from solenoid

#### 6. Install Navitas Adaptor Harness

- Connect Navitas adaptor harness to controller (push and listen for 'click' to lock the connector)
- Connect OEM wire harness to adaptor harness

#### 7. Install On-The-Fly Programmer (optional)

- Install OTF (optional) (see install description in RXV INSTALL instructions, p10)
- Connect OTF to Navitas adaptor harness
- Zip Tie loose cables

#### 8. TESTING INSTALLATION

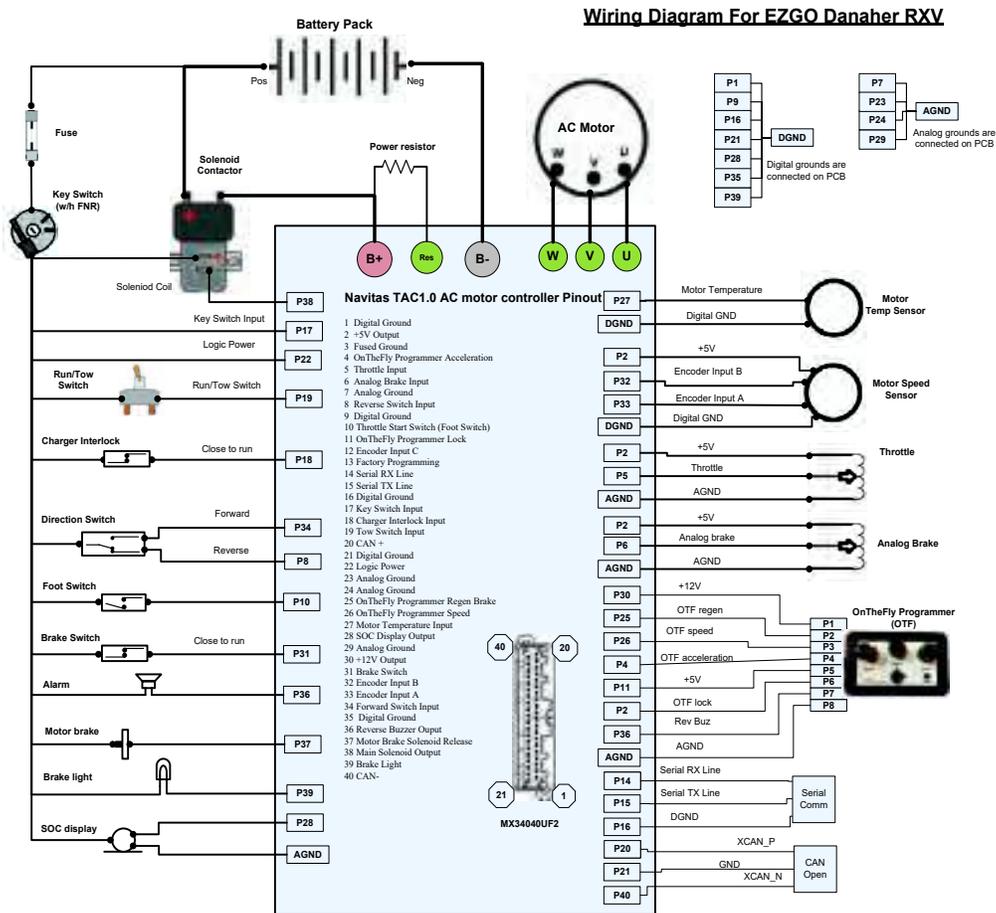
- Lift drive wheels off ground
- Reconnect battery pack
- Turn Key to Forward Position
- Press on Throttle to activate wheels



# INSTALLATION INSTRUCTIONS

## RXV 23 (Danaher) Installation cont'd

### Pinout for Controller

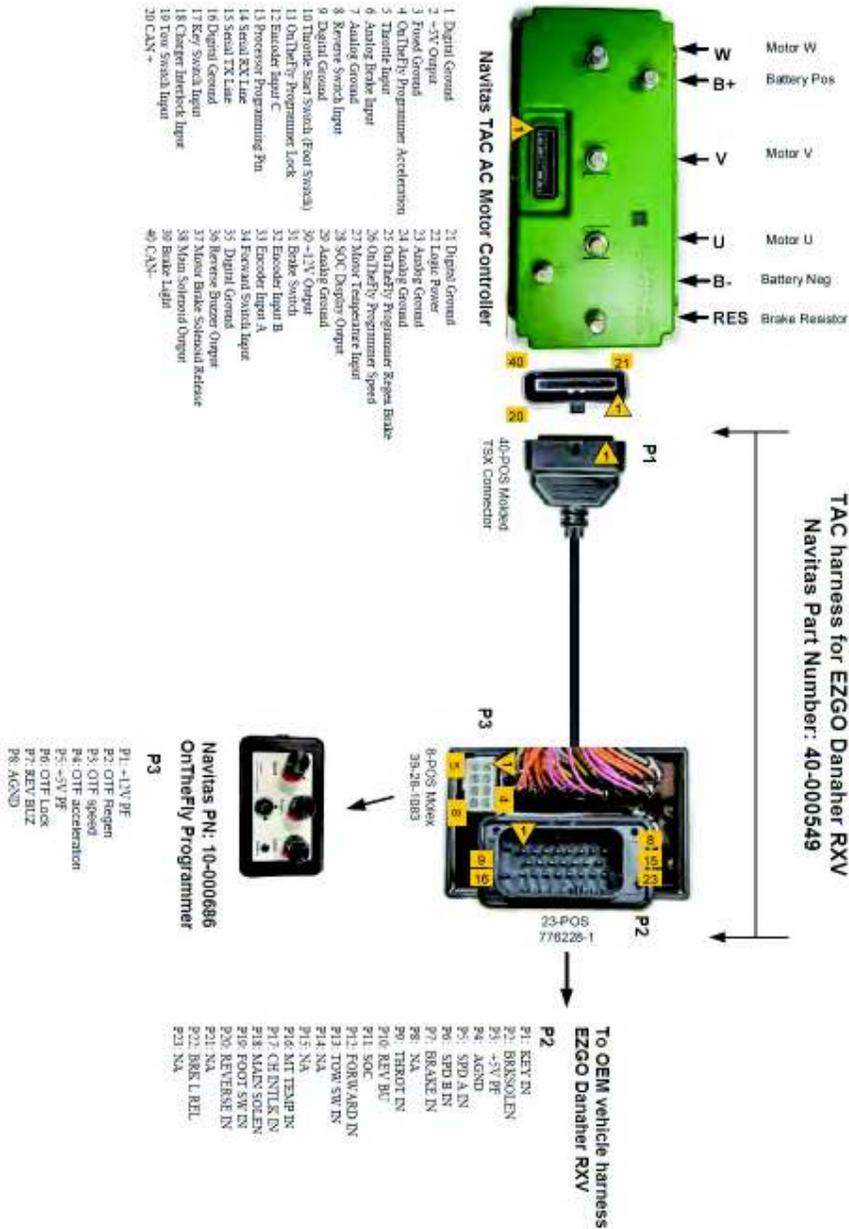


Wiring Harness Pinout Diagrams and other updates available at:  
[NavitasVS.com/support](http://NavitasVS.com/support)

# INSTALLATION INSTRUCTIONS

## RXV 23 (Danaher) Installation cont'd

### Pinout for Harness



## INSTALLATION INSTRUCTIONS

### E-Z-GO Installation



## CAUTION

Disconnect all batteries before beginning installation. If the car has a run/tow switch, you must place the switch in the TOW position first!



#### PARTS INCLUDED

- AC Controller
- AC 5 kW motor
- Navitas adaptor harness for E-Z-GO TXT
- On-The-Fly programmer (Optional)
- Mounting plate and hardware
- Run/Tow switch mount
- Motor phase cable
- Speed sensor/motor temperature harness



#### 1. Power down

- Turn off key, disconnect battery
- Put car on a stand and block wheels
- Use insulated tools
- Never use battery as workbench

#### 2. Remove Controller Cover

- Remove cables from controller
- Unclip OEM Wire Harness



#### 3. Remove OEM Controller

#### 4. Install TXT Mounting Plate

- Align plate with existing holes (where OEM controller was fastened) and fasten with screws
- Attach Run/Tow switch mount and fasten Run/Tow switch to mount.

## INSTALLATION INSTRUCTIONS

### E-Z-GO Installation cont'd

#### 5. Mount Controller

- Install Navitas AC controller
- Connect B- from battery, B+ from solenoid and motor phase cables to U, V, W (use new cable provided as 'W' and re-use the 2 existing motor phase cables from A1=U, A2=V) to the controller

#### 6. Motor Conversion

- Remove motor phase cables A1, A2 from motor
- Remove and DISCARD field cables (F1, F2)
- Remove DC motor
- Install Navitas AC motor
- Connect new speed sensor/motor temp harness to motor
- Connect motor phase wires from controller (A1 =U, A2 = V and new cable = W)
- Check cabling to make sure U, V, and W match exactly from motor to controller

#### 7. Install Navitas Adaptor Harness

- Connect Navitas adaptor harness to controller (push and listen for 'click' to lock the connector)
- Connect OEM wire harness to adaptor harness
- Connect speed sensor/motor temperature wire harness to adaptor harness

#### 8. Install On-The-Fly Programmer (optional)

- Install OTF (optional) (see install description in RXV INSTALL instructions, p10)
- Connect OTF to Navitas adaptor harness
- Zip Tie loose cables

#### 9. Test Installation

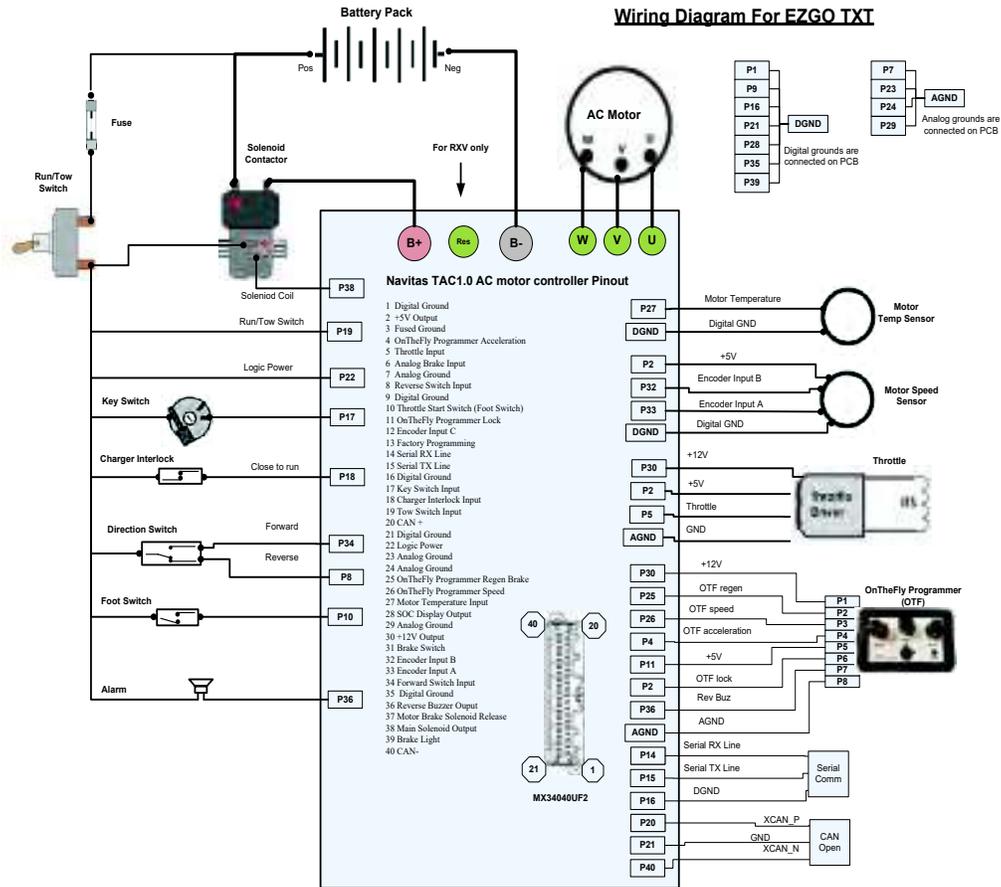
- Lift rear wheels
- Reconnect battery pack
- Put in "RUN" mode
- Turn key on
- Put in "F" for **Forward**
- Press on throttle to activate wheels



INSTALLATION/ SERVICE MANUAL  
**INSTALLATION INSTRUCTIONS**

E-Z-GO Installation cont'd

Pinout for Controller



Wiring Harness Pinout Diagrams and other updates available at:  
[NavitasVS.com/support](http://NavitasVS.com/support)



## INSTALLATION INSTRUCTIONS

### Club Car IQ (Precedent) Installation



## CAUTION

Disconnect all batteries before beginning installation. If the car has a run/tow switch, you must place the switch in the TOW position first!



#### PARTS

- AC 5 kW motor
- AC Navitas controller
- Mounting plate with hardware
- Motor phase cable (4AWG)
- Speed sensor/motor temperature harness
- B+ cable for replacement from controller to solenoid
- Navitas adaptor harness for Club Car



#### 1. Power down

- Turn off key, disconnect battery
- Put car on a stand and block wheels
- Use insulated tools
- Never use battery as workbench

#### 2. Remove Controller Cover

- Remove cables from controller
- Unclip OEM wire harness



#### 3. DC Motor and Controller Removal

- Raise car safely with jack/hoist and place on stands to be able to work safely from underneath car
- Remove (A1, A2, F1, F2 cables from DC Motor) dispose of F1, F2 cables and keep A1,A2 cables
- Unclip plastic wall covering of controller and solenoid
- Cut off the short B+ cable from DC controller to solenoid and continue to use the B+ Cable from A2 to controller
- Remove cables from DC controller

## INSTALLATION INSTRUCTIONS

### Club Car IQ (Precedent) Installation cont'd

#### 4. Install AC Controller

- Install Navitas AC controller onto NEW Club Car Precedent mounting plate
- Connect motor phase cables A1=U A2 =V and NEW Motor Cable (in Kit) =W to the controller
- Connect NEW B+ cable from solenoid to controller and existing B- cable from battery pack to controller
- Install OTF (Optional). See OTF installation instructions in RXV install description, p10
- Connect Navitas adaptor harness to controller (listen for “click” of tab locking)
- Connect OTF to adaptor harness (optional)
- Connect NEW speed sensor/motor temperature harness to adaptor harness
- Connect OEM wiring harness to adaptor harness

#### 5. Install Mounting Plate (with Controller and all attachments to controller completed)

- Install NEW mounting plate (with controller connected) using the 2 holes from previous Curtis controller mount

#### 6. Install AC Motor

- Re-connect A1=U, A2=V and NEW motor cable=W from controller to the AC motor (examine to make sure the cables align from controller to motor exactly...U-U, V-V and W-W)
- Connect new speed sensor/motor temperature harness from adaptor harness to AC motor

#### 7. TESTING INSTALLATION

- Make sure drive wheels are in the air
- Reconnect battery pack
- Put in **RUN** mode
- Turn key **On**
- Put in **“F”** for **Forward**
- Press on throttle to activate wheels



Mounting plate.

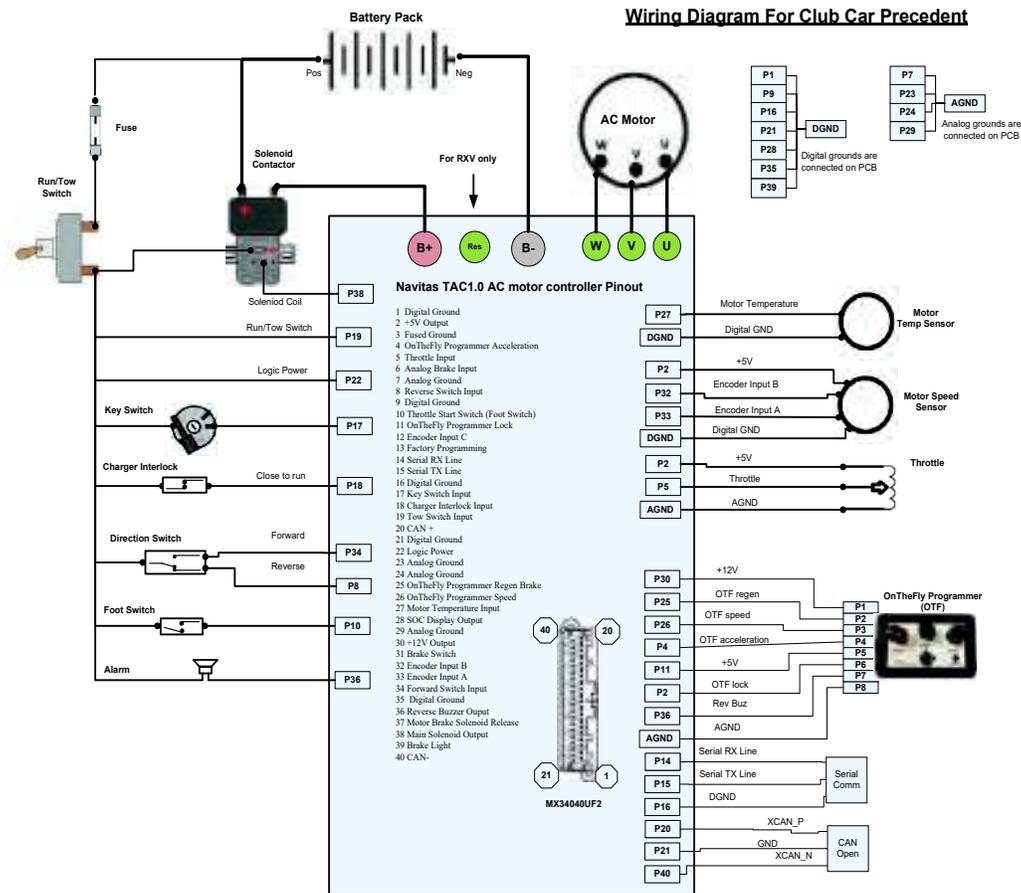


Mounting plate with controller fastened in place.

# INSTALLATION INSTRUCTIONS

## Club Car IQ (Precedent) Installation cont'd

### Pinout for Controller



Wiring Harness Pinout Diagrams and other updates available at:  
[NavitasVS.com/support](http://NavitasVS.com/support)



## TROUBLESHOOTING

FLASH CODES	FLASH CODE MESSAGE	DESCRIPTION	SOLUTION	HOW TO CHECK
1-1	<b>Throttle Fault</b>	<p>The foot switch is not engaged and the throttle signal voltage is above minimum throttle parameter.</p> <p>This indicates the foot switch is not coming on or the throttle has broken where its off voltage is to high</p>	<ul style="list-style-type: none"> <li>• Check wiring</li> <li>• Replace throttle</li> </ul>	<ul style="list-style-type: none"> <li>• The diagnostic page of the App will give you readings for the throttle voltage and foot switch.</li> <li>• Put the vehicle in neutral and slowly depress the throttle.</li> <li>• The foot switch should change from <b>Off to On</b> before the throttle voltage reaches around 1V.</li> <li>• Standard throttles usually read 0.5V when off. The minimum voltage to start the vehicle is usually 1V. The maximum when depressed should read around 4V.</li> </ul>
1-2	<b>Brake Fault</b>	<p>The analog brake signal is higher than the high voltage threshold which is 4.64V.</p> <p>These types of brake pedals are only installed on certain types of vehicles such as RXV's.</p>	<ul style="list-style-type: none"> <li>• Check wiring</li> <li>• Replace brake switch</li> </ul>	<ul style="list-style-type: none"> <li>• The diagnostic page of the App will give you readings for the brake voltage</li> <li>• Put the vehicle in neutral and slowly depress the brake.</li> <li>• Standard analog brakes usually read 0.5V when off. The minimum voltage to stop the vehicle is usually 1V. The maximum when depressed should read around 3V to 4V</li> </ul>
1-3	<b>Charger Interlock</b>	<p>Charger is connected and the vehicle is not in neutral.</p> <p>Vehicle charging port may be wet Club Car On Board Computer (OBC) is in sleep mode.</p>	<ul style="list-style-type: none"> <li>• Disconnect the Charger before trying to move.</li> <li>• Dry and clean the charger port</li> <li>• Depress the throttle twice to wake up OBC.</li> <li>• Replace charger port on vehicle</li> </ul>	<ul style="list-style-type: none"> <li>• The diagnostic page of the App will give you readings for the charger input connected signal.</li> <li>• The charger input will read off when there is no charger connected.</li> </ul>
1-4	<b>Temperature (Controller)</b>	<p>Performance is limited because the controller is hot.</p>	<ul style="list-style-type: none"> <li>• Let vehicle cool off, system is over worked.</li> </ul>	<p>Check the temperature of the controller with a non-contact temperature sensor</p>
1 - 5	<b>Temperature (Motor)</b>	<p>Performance is limited because the motor is hot.</p>	<ul style="list-style-type: none"> <li>• Let vehicle cool off, system is over worked.</li> </ul>	<ul style="list-style-type: none"> <li>• Check the temperature of the motor with a non-contact temperature sensor.</li> </ul>

## TROUBLESHOOTING cont'd

FLASH CODES	FLASH CODE MESSAGE	DESCRIPTION	SOLUTION	HOW TO CHECK
1 - 6	<b>Solenoid High Resistance</b>	Voltage across solenoid (battery side (logic power) to controller side measured (B+ terminal)) is greater than the hard coded 5V.	<ul style="list-style-type: none"> <li>• Replace solenoid</li> </ul>	<ul style="list-style-type: none"> <li>• Test the solenoid by measuring ohms across the large terminals.</li> <li>• The error usually only occurs when drawing large currents (200A) through the solenoid. The solenoid may be under rated or oxidizing with ag</li> </ul>
1 - 7	<b>Flash Memory Error</b>	Code updates from the App may force this error so cause the user to press the Initialize button and Save button.	<ul style="list-style-type: none"> <li>• Press the Initialize button and Save button in the App.</li> </ul>	
2 - 1	<b>Direction Switch Fault</b>	Both FWD & REV signal came on at the same time.	<ul style="list-style-type: none"> <li>• Check and replace FWD &amp; REV switch</li> </ul>	<ul style="list-style-type: none"> <li>• The diagnostic page of the App will give you readings for the Forward switch and Reverse switch</li> <li>• Check the Switch. Does the Switch feel the same when toggled from FWD to Neutral to REV? If so check continuity of the switch.</li> </ul>
2 - 2	<b>Main Solenoid</b>	Voltage across solenoid (battery side to controller side measured B+ terminal ) is greater than the hard coded 1V after solenoid has closed	<ul style="list-style-type: none"> <li>• Confirm the solenoid is working properly. Change solenoid if required.</li> </ul>	<ul style="list-style-type: none"> <li>• Put vehicle in Neutral. Measure voltage on main terminals (high current connections) of the solenoid. Depress throttle and listen for solenoid to click. If solenoid clicks and the voltage does not drop to zero between the main terminals. Replace solenoid.</li> <li>• If solenoid does NOT click measure the voltage across the small terminals of the solenoid when the throttle is depressed. It should read the battery voltage. If it reads the battery voltage the solenoid is bad. If it does not read the battery voltage check vehicle wiring</li> </ul>

## TROUBLESHOOTNG cont'd

FLASH CODES	FLASH CODE MESSAGE	DESCRIPTION	SOLUTION	HOW TO CHECK
2 - 3	<b>Controller not pre-charging</b>	Abnormally low voltage on the controller between B+ and B-.	<ul style="list-style-type: none"> <li>• Clean and dry off the controller</li> <li>• Check voltage</li> <li>• Check all wires are connected to controller</li> <li>• <b>DO NOT replace the controller until all of the "How to Check" diagnostics regarding Flash Code 2 - 4 have been completed and the motor has been tested for short circuits!</b></li> </ul>	<ul style="list-style-type: none"> <li>• The dashboard page of the App will give you readings for the battery voltage.</li> <li>• Visually check for debris or moisture on controller terminals and wires (There may be a short across the B+ and B- terminals).</li> <li>• Check the voltage between B+ and B- on the controller. It should equal the battery pack voltage.</li> <li>• Check that the wires are not damaged.</li> <li>• Check that no accessories (light kits, stereos, etc.) are using the frame as a ground.</li> <li>• Remove all cables except B- from the controller.</li> <li>• Tape cables so they do not touch each other or the vehicle frame. Controller harness should remain plugged into the controller.</li> <li>• Move Run/Tow switch to Run, turn on key switch, depress the throttle. If Flash Code 2-4 returns replace the controller.</li> <li>• Otherwise there is a wiring problem. Reconnect wires one at a time (turn off RUN/TOW switch each time) until Flash Code 2-4 returns. This will indicate where the wiring issue is located.</li> </ul>
2 - 4	<b>Main Solenoid Current Fault</b>	Solenoid coil takes too much current.	<ul style="list-style-type: none"> <li>• Check for loose wires or a short across small terminals on the solenoid.</li> <li>• Replace main solenoid.</li> </ul>	<ul style="list-style-type: none"> <li>• Check for loose wires. If there is a diode across the solenoid check that it is not shorted.</li> <li>• Test solenoid by measuring resistance across the small terminals of the solenoid. The resistance should be greater than 48 OHMS if it is a single coil solenoid and greater than 20 OHMS if it is a double coil solenoid.</li> </ul>
2 - 5	<b>Parking Brake Solenoid (Connected to motor) Current Fault</b>	Solenoid coil takes too much current.	<ul style="list-style-type: none"> <li>• Check for loose wires or a short across small terminals on the solenoid.</li> <li>• Replace main solenoid.</li> </ul>	<ul style="list-style-type: none"> <li>• Check for loose wires. If there is a diode across the solenoid check that it is not shorted.</li> <li>• Test solenoid by measuring resistance across the small terminals of the solenoid. The resistance should be greater than 48 OHMS if it is a single coil solenoid and greater than 20 OHMS if it is a double coil solenoid.</li> </ul>

## TROUBLESHOOTING cont'd

FLASH CODES	FLASH CODE MESSAGE	DESCRIPTION	SOLUTION	HOW TO CHECK
3 - 1	<b>Battery Under Voltage</b>	Batteries are empty or too low.	<ul style="list-style-type: none"> <li>• Recharge batteries</li> <li>• Check for bad or damaged batteries.</li> <li>• Check battery cables are not loose or damaged.</li> <li>• Check solenoid</li> </ul>	<ul style="list-style-type: none"> <li>• Use a battery load tester to verify battery condition after charging.</li> <li>• Connect volt meter batteries. (Use alligator clips). Measure the voltage while driving to see if the voltage drops.</li> <li>• Connect Volt meter to the controller if the voltage drops at the controller and not at the battery then the solenoid may be bad.</li> </ul>
3 - 2	<b>Battery Over Voltage</b>	Batteries are over charged or not excepting any more regenerative currents	<ul style="list-style-type: none"> <li>• Check for bad or damaged Batteries.</li> <li>• Check Battery Cables are not loose or damaged.</li> <li>• Check Solenoid</li> </ul>	<ul style="list-style-type: none"> <li>• Use a battery load tester to verify battery condition after charging.</li> <li>• Connect volt meter batteries. (Use alligator clips). Measure the voltage while driving to see if the voltage rises.</li> <li>• Connect volt meter to the controller if the voltage rises at the controller and not at the battery then the solenoid may be bad.</li> </ul>
3 - 3	<b>Motor Over Current</b>	Motor current has risen above the maximum motor current parameter.	<ul style="list-style-type: none"> <li>• Check Motor U,V,W cables are not shorted to ground</li> </ul> <p><b>See diode chart below</b></p>	<ul style="list-style-type: none"> <li>• The diagnostics page of the App will give you readings for the U phase voltage, V phase voltage, W phase voltage</li> <li>• The phases should read around half the battery voltage.</li> <li>• Disconnect phases at controller and check readings again</li> </ul>

## TROUBLESHOOTING cont'd

NON-FLASH CODE ERRORS. Note: The list below shows some possible issues when the Controller does not show a Flash Code Error. These issues are mainly related to the Vehicle. Always check the Manufacturers Service Manual.

ISSUE	CAUSE	HOW TO CHECK
The Vehicle is moving slower than normal.	<ul style="list-style-type: none"> <li>Batteries are discharged</li> <li>Bad or damaged motor</li> <li>Faulty speed sensor</li> <li>Faulty throttle</li> <li>OTF programmer is locked at low speed</li> </ul>	<ul style="list-style-type: none"> <li>Re-charge the batteries</li> <li>Check brakes are releasing properly and vehicle is easy to push</li> <li>Check motor</li> <li>With the App verify throttle reaches maximum value</li> <li>Connect the OTF programmer, unlock it and adjust to desired speed. Note: Lock OTF programmer before removing it or the settings may change.</li> </ul>
Vehicle is shutting down	<ul style="list-style-type: none"> <li>Check vehicle wiring for loose connections</li> <li>Check the OBC (On Board Computer)</li> </ul>	<ul style="list-style-type: none"> <li>Check the OBC by referring to the "OBC section" in the manufacturer's service manual.</li> </ul>
Oscillations or bumpy feel when driving.	<ul style="list-style-type: none"> <li>Motor compatibility</li> </ul>	<ul style="list-style-type: none"> <li>Check that the motor is on the Navitas recommended motors list</li> </ul>
Vehicle feels sluggish after driving for a while.	<ul style="list-style-type: none"> <li>Battery cables are undersized</li> </ul>	<ul style="list-style-type: none"> <li>Upgrade the power cables to recommended 4AWG</li> </ul>
Faulty Controller	<ul style="list-style-type: none"> <li>Controller malfunction</li> </ul>	<ul style="list-style-type: none"> <li>Use a digital multi-meter set to diode mode </li> <li>Remove all wires and cables on controller</li> <li>Use "Controller Diode Test" chart below to test the controller</li> </ul>
Car Stutters	<ul style="list-style-type: none"> <li>Motor cables are not connected properly</li> </ul>	<ul style="list-style-type: none"> <li>Check motor cables properly connected U-U&lt; V-V, W-W</li> <li>Check speed sensor wires not crossed.</li> </ul>

Table 1 Controller Test Diode Chart

BLACK LEAD 	RED LEAD 	VOLTAGE 
B+	U	0.42 V approx.
U	B-	0.42V approx.
B+	V	0.48V approx.
V	B-	0.48V approx.
B+	W	0.48V approx.
W	B-	0.48V approx.

## ACCESSORIES

### Bluetooth® Apps for TSX 3.0 and greater

Customer and Dealer App available for Android and Apple IOS:



IOS: <https://itunes.apple.com/us/app/dashboard-navitas/>



Android: <https://play.google.com/store/apps/developer?id=Navitas+Vehicle+Systems+Ltd.>



#### Free Bluetooth Driver App\*

##### Features and Benefits

- Monitor "live" battery voltage level
- Battery watering reminder
- Bluetooth Lockout (lock the car out with one button)
- Use the App as a DISPLAY and make use of the built-in Speedometer
- Forward error diagnostics directly to your service technician/dealer for quick REMOTE diagnosis



#### Bluetooth Dealer App\*

Download available upon registration with Navitas  
Call Toll-Free: 1-844-576-2499

##### Features and Benefits

- Customize your settings
- Tune car performance
- Limit/set top speed
- Activate OverDrive function
- Pick motor pre-configured for ultimate performance and efficiency, including overheating safeguards
- Troubleshoot **on site** with diagnostic reporting using any iOS or Android enabled device
- Technicians can also diagnose cars **remotely** via diagnostic car errors sent directly from customers via email
- Emails can also be forwarded to **NAVITAS** engineering department for additional support
- Upgrade Firmware with ease.

\*Actual screen format and features may vary.

Visit [NavitasVS.com/support](http://NavitasVS.com/support) for more App support documentation.

**APPENDIX A**

MAC Performance Motor



**MAC**

High Performance AC Golf Car Motor (10-000726)

MOTOR *FEATURES*

- ✓ Hi Quality AC Induction motor
- ✓ External Speed Sensor
- ✓ Internal temperature sensor
- ✓ Steel and Aluminum construction
- ✓ High torque with High speed

MOTOR *DATA*

Type of Motor	AC Induction
Rated power	5 KW
Rated Voltage	34 V ( AC )
Rated Current	113 A
Rated Speed	2785 r/min
Frequency	0-200 Hz
RPM	0-5875 r/min
Insulation class	F
Protection mode	IP44



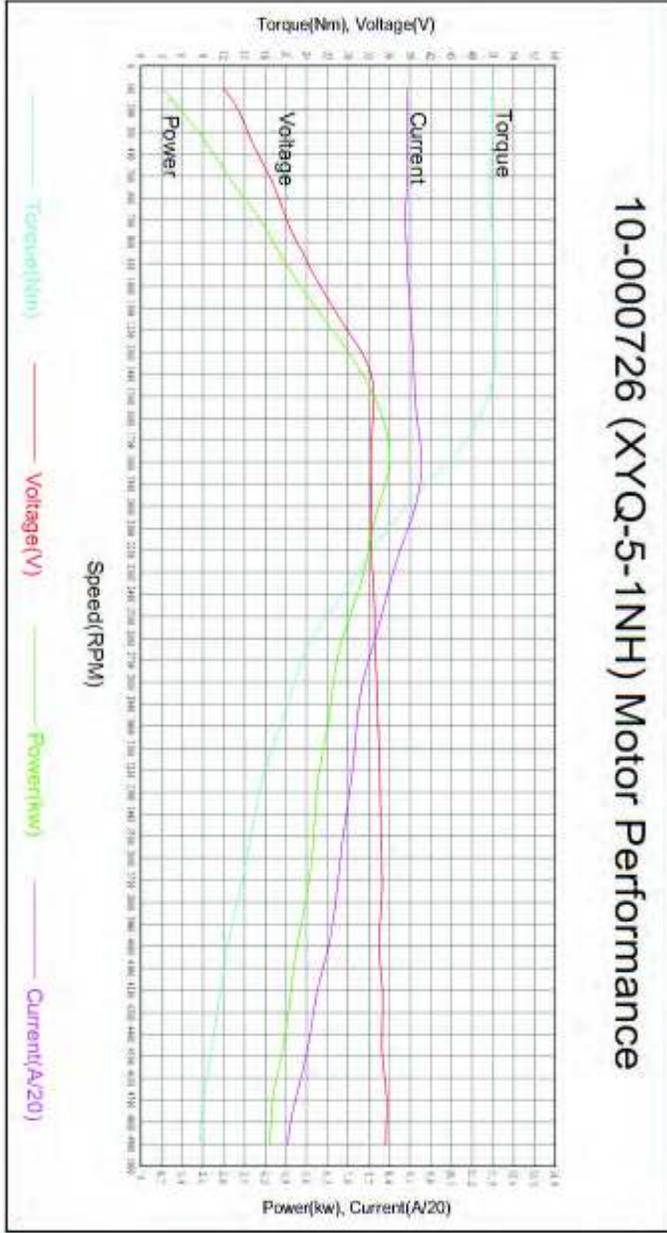
Applications

- ✓ Golf Car
- ✓ Utility Vehicle
- ✓ Motorcycle
- ✓ Personnel Carriers

[www.navitasvs.com](http://www.navitasvs.com)

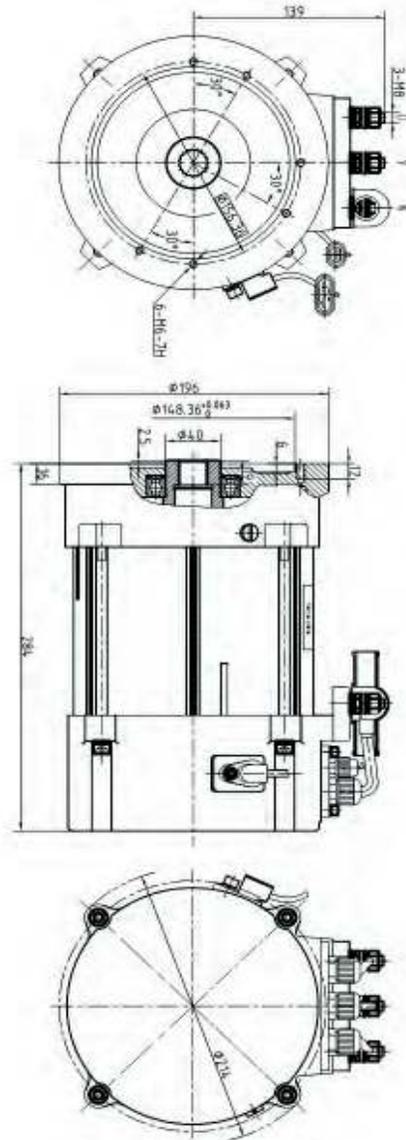
# APPENDIX A

## MAC Performance Motor, cont'd



**APPENDIX A**

MAC Performance Motor cont'd



10-000726 (XYQ-5-1NH) AC Motor

Note: Specifications are subject to change without notice

## WARRANTY

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### Warranty Document #05-000102

Navitas Vehicle Systems Ltd. warrants that the products sold to Customer by Navitas will be free from defect in materials and workmanship as noted below, from the date of manufacturing shipping of the product, subject to the terms and conditions in this Limited Warranty.

1. TSX, TSX2.0,TSX3.0, Separately Excited Models, TPM Permanent Magnet Models, TAC AC Induction Models – 24 months
2. TSE Series Models, PSE Hydraulic Models, CTL Series Models – Lessor of 12 months or 4,000 hours
3. MAC AC Motor – 12 months

If, during the applicable warranty period, (i) Navitas is advised in writing as to a defect in a Navitas product; (ii) such product is returned to a receiving point designated by Navitas; and (iii) an examination of such product discloses to Navitas' reasonable satisfaction that such product is defective and such defect was not caused by accident, abuse, neglect, alteration, improper installation, lightning damage, submersion, short circuits due to improper handling, repair, improper testing or use contrary to any instruction issued by Navitas, Navitas will repair or replace the defective product at no cost to Customer, except for transportation costs. Replacement shall mean furnishing the Customer with a new product equivalent to the defective product. All defective products replaced by Navitas under this warranty shall become the property of Navitas and must be returned to Navitas properly packed to prevent physical damage.

Navitas does not warrant that any product is suitable for use in any particular application. Customer shall be responsible for evaluating the appropriateness of the use of any specific Navitas product for a particular application. Navitas shall be entitled to rely exclusively upon such representation in furnishing any product to Customer.

TSX and TAC Products Application is for Golf Car and LSV Vehicles with speeds of up to of 25MPH. Users must comply with Federal, County and Municipal Bylaws & Regulations when operating vehicles.

#### Warranty Limitations

The foregoing warranty constitutes Navitas' exclusive Liability and the exclusive remedy of Customer for any breach of or any other nonconformity of the products covered by this warranty. This warranty is exclusive and in lieu of all other warranties. Navitas makes no warranty, expressed or implied or statutory including, without limitation, any warranty of merchantability or fitness for a particular purpose.

No representative, employee, distributor or dealer of Navitas has the authority to make or imply any warranty, representation, promise or agreement, which in any way varies the terms of this limited warranty.

The Navitas products sold to Customer are intended to be used only in the application specified by Customer to Navitas. Any other use renders the Limited Warranty expressed herein and all implied warranties null & void and same are hereby excluded. Under no circumstances shall Navitas be liable to Customer or any third party for consequential, incidental, indirect, exemplary, special or other damages whether in an action based on contract, tort (including negligence) or any other legal theory, arising out of or related to the products sold to Customer, including but not limited to lost profits or loss of business, even if Navitas is apprised of the likelihood of such damages occurring.

This limited warranty may not be changed, modified, limited or extended in scope except by a written agreement signed by Navitas and Customer. Except as stated, any purported modification of this limited warranty shall be null and void.

**March 2018**

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