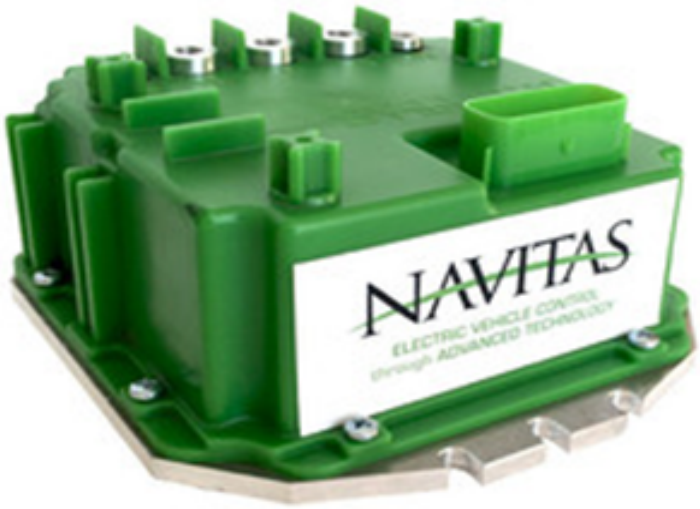
Navitas Vehicle Systems Ltd.

NAVITAS 36V-48V
FOR SERIES & SHUNT WOUND DC MOTOR CONTROLLER
Installation/Service Manual



Instructions for:

Club Car Precedent & DS with Curtis 1510/1515 Controller

E-Z-GO TXT 48V with Curtis 1206HB Controller

E-Z-GO TXT 36V with Curtis 1206MX Controller

Yamaha Drive with Moric Controller JW2

Also compatible with:

Curtis 1520, 1268 (Resistive Throttle)

Curtis 1264, 1268 (ITS Throttle) ITS E-Z-GO 48V

Yamaha G19/G22

Series Carts (This Manual does not contain the Full Series Instructions. The Series Module Wiring Instructions are Included with the Series Vehicle Personality Module. Both Manuals are required for Series Cart Installation.)

NAVITAS

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BEST PRACTICES

To maximize your vehicle's driving Range only use the speed you need

- Use the Speed Knob to Control your maximum cruising Speed rather than the accelerator. Turn the speed down to the minimum practical speed necessary for the application. The controller significantly increases the operating efficiently 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 battery 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 loosing 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 fold-back 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, the controller will reduce the amount of power it supplies to the motor to protect the battery pack.
- Cycling the key will reset full controller power for 1 minute but doing so repeatedly will adversely affect the life of your battery pack. 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 too touch, then your application is probably too demanding and we recommend that you upgrade the motor to a Heavy-Duty unit and the cables to at least 2 AWG.

Warnings

- Always monitor the motor & battery wiring temperatures after changing the programmer settings – 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 TSX 2.0 420A 36-48V Controller & TSX 2.0 600A 36-48V Controller SERIES & SHUNT WOUND DC 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 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, labeling 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 #
10-000673 TSX 2.0 600A 36-48V CONTROLLER	
10-000681 TSX 2.0 420A 36-48V CONTROLLER	

WARNINGS

SAFETY WARNINGS

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.

FAILURE to follow ALL WARNINGS AND INSTRUCTIONS can damage the Controller and /or the Vehicle and/or cause SERIOUS INJURY OR DEATH!

- Do not leave children or pets unattended in or near the vehicle.
- Never drive too fast! The Terrain, conditions and the operator's skill will determine a safe speed.
- Drive at a reduced speed and use extra caution when carrying passengers or cargo.
- Avoid sharp turns and do not accelerate quickly when turning.
- 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.
- Keep electrical components dry and DO NOT wash with direct stream or power washer.
- Never re-wire, by-pass or change the wires, switches, or controller. Contact your dealer or the manufacturer if vehicle is not operating correctly.
- Keep the controller and the area around it clean and free of debris.
- Speed sensor required to be installed.
- Vehicle and 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.navitasvehiclesystems.com. Or call 1-519-342-0948

⚠ 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.

- Always proceed with caution. Keep speed low and do not drive faster than conditions permit. The terrain, conditions and the operator's skill will determine a safe speed. Avoid sharp turns and do not accelerate quickly when turning; this can cause the vehicle to slide sideways or skid out of control. Abrupt maneuvers 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.

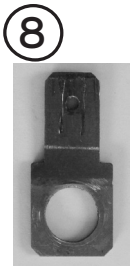
CONTROLLER PARTS LIST

Confrm that all parts listed below are with your kit before starting Installation.

This kit includes either the TSX 2.0 420A 36-48V Controller or the TSX 2.0 600A 36-48V Controller.

If you are missing parts please contact your local dealer.

	PART DESCRIPTION	PART #	QTY
1	TSX 2.0 600A 36-48V Controller	10-000673	1
1	TSX 2.0 420A 36-48V Controller	10-000681	1
2	M8 X 16 Hex Cap 8.8 Zinc (Not Shown)	80-000901	3
3	M6 X 16 Hex Cap 8.8 Zinc (Not Shown)	80-000902	2
4	M8 Lock Washer (Not Shown)	80-000910	3
5	M6 Lock Washer (Not Shown)	80-000909	2
6	M8 Flat Washer (Not Shown)	80-000888	3
7	M6 Flat Washer (Not Shown)	80-000889	2
8	Spade Connector 6.3MM (for Club Car Precedent & DS, E-Z-GO TXT 36V Yamaha Drive)	20-001010	2
9	2 AWG 5/16" Ring Terminal (Yamaha Drive Only!)	40-000536	1



NOTE: Club Car Precedent Harness Shown

WIRING PARTS LIST

This kit includes only one of the Harnesses listed below. Note: some Harnesses look similar.

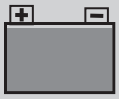
Make sure to check the part number and description label on the bottom of the Harness before connecting to the Controller.

	PART DESCRIPTION	PART #	QTY
1*	Harness for Curtis 1510/1515 Controller (Club Car Precedent&DS), when using 4WD kit	40-000477	1
1*	Harness for Curtis 1206MX Controller (E-Z-GO TXT 36V)	40-000512	1
1*	Harness for Curtis 1206HB Controller (E-Z-GO TXT 48V),when using 4WD kit	40-000476	1
1*	Harness for Moric JW2 Controller(Yamaha Drive)	40-000513	1
1*	Harness for Yamaha G19/G22	40-000514	1
1*	Harness for Curtis 1520, 1268 (Resistive Throttle)	40-000515	1
1*	Harness for Curtis 1264, 1268 (ITS Throttle) ITS E-Z-GO 48V	40-000516	1
1*	Harness for DCS 36V Controller (E-Z-GO TXT DCS 36V)	40-000540	1
1*	Harness for Curtis 1206HB Controller (E-Z-GO TXT)	40-000541	1
1*	Harness for Curtis 1510/1515 Controller (Club Car (IQ))	40-000542	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 Manufacturers 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 10-000681 420A 36-48V & 10-000673 600A 36-48V Controllers must be done by a trained golf car technician.
Before installing or servicing of the NAVITAS 10-000681 420A 36-48V or 10-000673 600A 36-48V 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
- Disconnect the Main (+) Positive and (-) Negative Cable on the Vehicle's Battery System.
- 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 36-48V 10-000681 420A & 10-000673 600A Controller Installation /Service and All Warning Labels before servicing or troubleshooting this Vehicle.
- The Controller is sealed and can not 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 shock.
- Never lay or put down tools in the Vehicle Battery Compartment.

Tools Required

- Ratchet Set
- Open End Wrench Set
- Electrical Tape
- Small Saw or Dremmel tool (Club Car Precedent)
- 4 Jack Stands
- Lift Jack (2 ton or more)
- Wheel Chocks

INSTALLATION INSTRUCTIONS

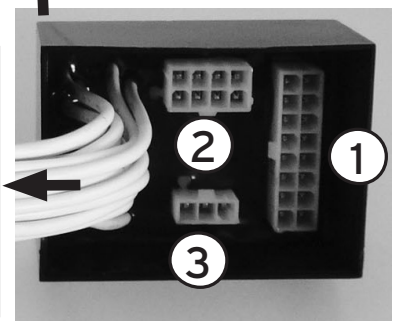
Wire & Connector Location Diagram

10-000681 420A 36-48V & 10-000673 600A 36-48V Controller-Harness

NOTE: Harness shown is for the Club Car Precedent, DS and the E-Z-GO TXT 48V, for Connector location for other Vehicles see the installation instructions for the specific Vehicle.

Connector Plug Location

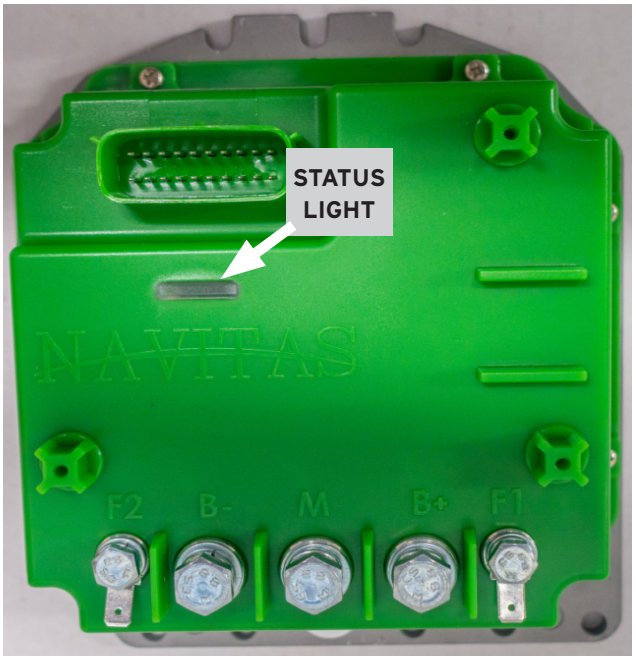
1	Vehicle	16 Pin	Vehicle Harness Connector
2	OTF	8 Pin	"On The Fly" Programmer *(Optional) Not included
3	4WD	3 Pin	SilverWolf 4WD System (WH03500 Extension Cable)-Option for FWD



CAUTION

DO NOT Attach any of these Connectors with out the RUN/TOW SWITCH in the TOW Position!

10-000681 420A 36-48V & 10-000673 600A 36-48V Controller- Wire Location



F1	FIELD WIRE	Field Switch Wire
B-	MAIN BATTERY NEGATIVE	BLACK Negative Cable from Battery.
M	MOTOR	
B+	MAIN BATTERY POSITIVE	RED Positive Cable from Battery.
F2	FIELD WIRE	Field Switch Wire

NOTE: F1 & F2 Field Wires if installed incorrectly the FWD/REV Switch will work in opposite direction.

The NAVITAS 10-000681 420A 36-48V & 10-000673 600A 36-48V Controllers have a Green and Red Status Light that will indicate the status of the Controller. It is locatedinside the controller and is visible through the top cover when the controller is powered.

Torque Specifications

F1 & F2	6 mm Bolt	60 in-lbs/ 5ftlbs/ 6.8Nm
B-/M/B+	8 mm Bolt	150 in-lbs/ 12.5ftlbs/ 16.9Nm

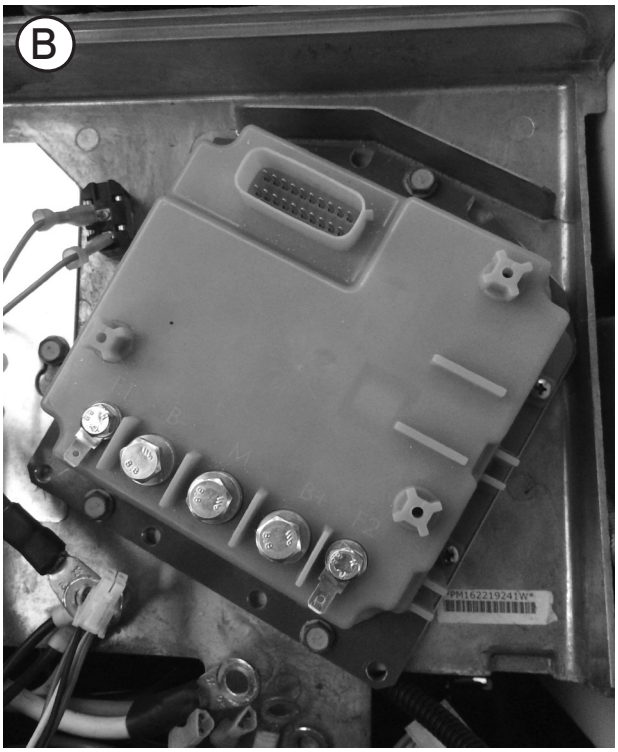
INSTALLATION INSTRUCTIONS

Club Car Precedent with Curtis 1510/1515 Installation

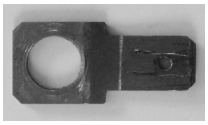
⚠ DANGER

- **Make sure the RUN/TOW Switch is in the TOW position.**
- **Make sure to Disconnect the Main Positive ⊕ and ⊖ Negative Cable on the Vehicle's Battery System.**

Before removing the original Controller take note or take a photo of the 5 Controller Posts and their corresponding Wires. Make sure that all groups of wires stay together.
Remove (A) the Vehicle Controller Cover and the Original Vehicle Controller. (B) Install the Controller using the 3 screws from the original controller.



SEE PHOTOS ON FOLLOWING PAGE
(C) Connect the Motor Cable from the original Controller to the M Post on the Controller using a M8 Bolt, Lock Washer and Flat Washer.
(D) Connect the Main Positive Red Power Cable along with the 2 SilverWolf 4WD Positive Red Power Cables (if installed) to the B+ Post on the Controller using a M8 Bolt, Lock Washer and Flat Washer.
(E) Connect the Main Negative Black Power Cable along with the 2 SilverWolf 4WD Negative Black Power Cables (if installed) to the B- Post on the Controller using a M8 Bolt, Lock Washer and Flat Washer.
(F) Install the F1 Field Wire from the original Controller to the F1 Post on the Controller using a Spade Connector and a M6 Bolt, Lock Washer and Flat Washer. (G) Install the F2 Field Wire from the original Controller to the F2 Post on the Controller Post using a Spade Connector and a M6 Bolt, Lock Washer and Flat Washer.



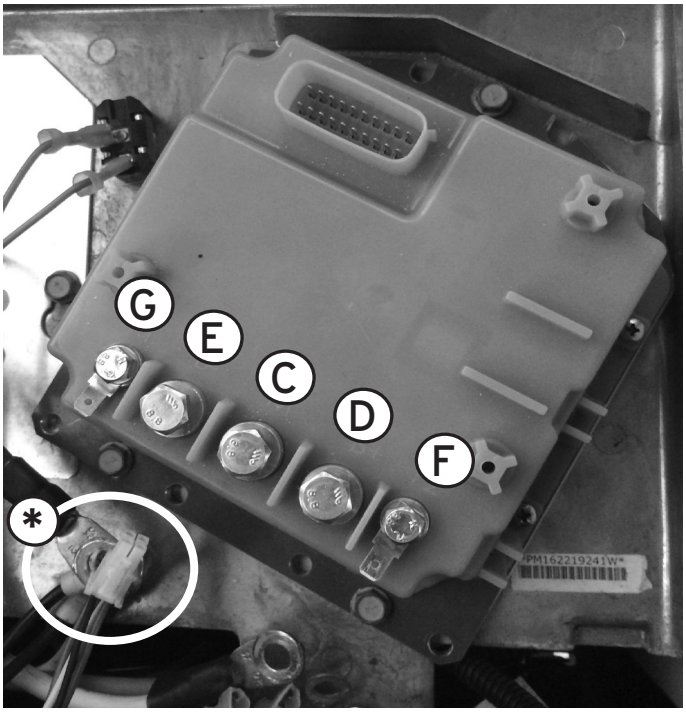
NOTE: Use these Spade Connectors on the F2 and F1 posts.

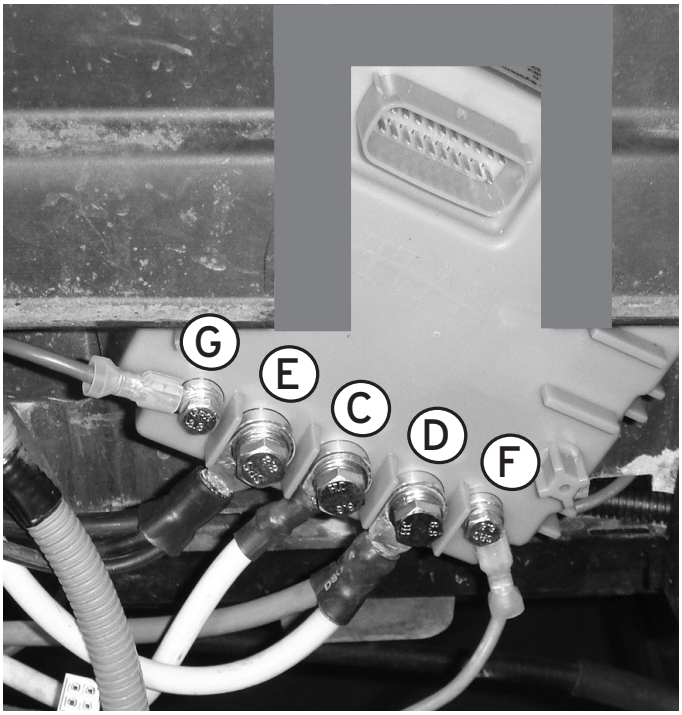
Torque Specifications

F1 & F2	**6 mm Bolt**	60 in-lbs/ 5ftlbs/ 6.8Nm
B-/M/B+	**8 mm Bolt**	150 in-lbs/ 12.5ftlbs/ 16.9Nm

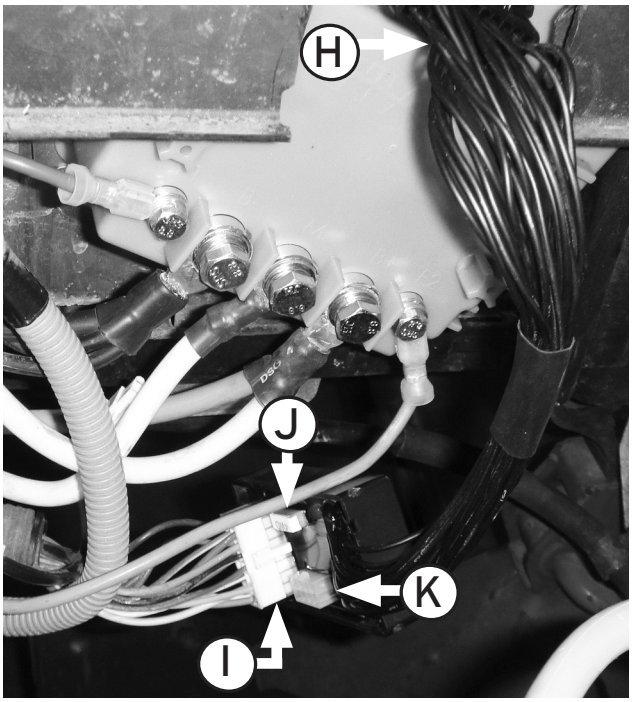
INSTALLATION INSTRUCTIONS

Club Car Precedent with Curtis 1510/1515 Installation cont'd.

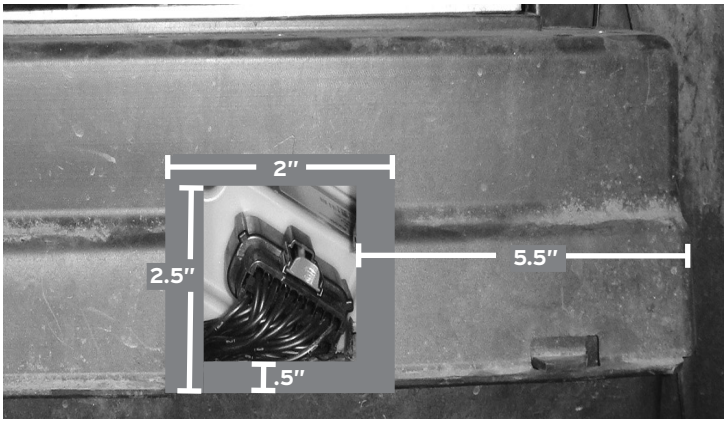




(H) Install the 20 Pin Connector on the Vehicle Module Harness to the Controller. Note: The plastic around this plug will need to be cut away to allow for the Body Cover to be re-installed. See the Cut Out instructions below.
(I) Install the 16 Pin Connector from the Vehicle Wiring Harness to the 16 Pin Connector on the Vehicle Module Harness.
(J) If the Vehicle has a SilverWolf 4WD System connect the Extension Harness from the Main Harness into the 3 Pin Connector on Harness.(K) This 8 Pin Connector is for the optional OTF "On The Fly" Programmer.
✱ There is a 4 Pin Connector on the Vehicle Harness that is used for the Club Car Programmer. This 4 Pin Connector is not used on the Navitas Controller and will be left unplugged.



Cut Out Instructions



If the Precedent has a six 8V Battery layout, the plastic on the Controller/Wiring Cover will need to be cut out to allow the 20 pin Connector on the Vehicle Module Harness to fit properly.
Caution: Remove the Harness before cutting in to theplastic Cover. Measure in from the outer right side of the cover 5.5" inches. Use a 2" wide piece of tape to cover an area 2" wide x 2.5" high.

Now the Vehicle's Main Battery Positive and Negative Cables can be re-connected.

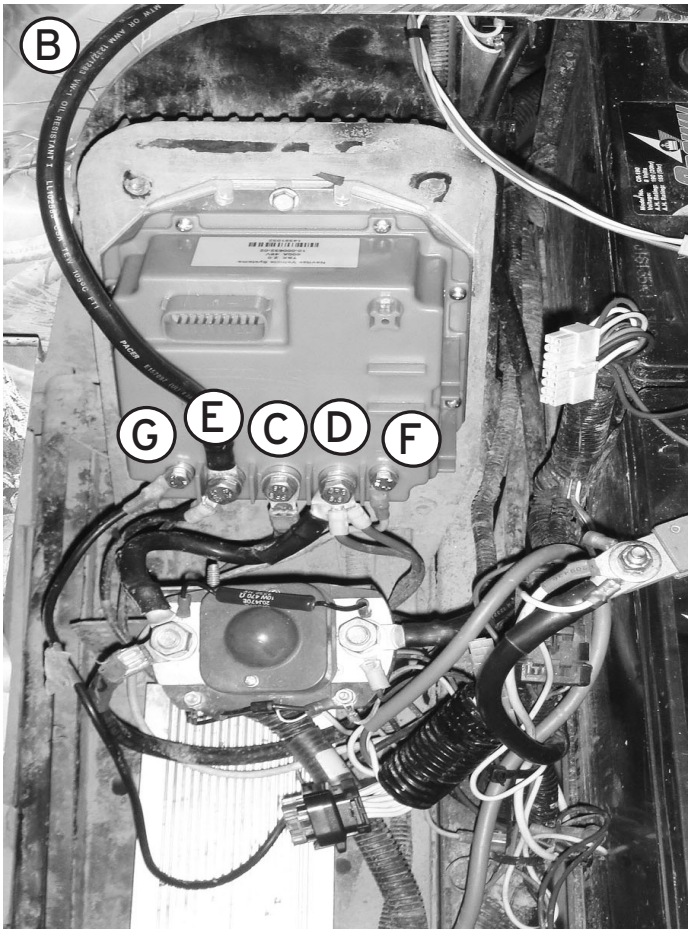
INSTALLATION INSTRUCTIONS

E-Z-GO TXT 48V with Curtis 1206HB Installation

⚠ DANGER

- **Make sure the RUN/TOW Switch is in the TOW position.**
- **Make sure to Disconnect the Main Positive ⊕ and ⊖ Negative Cable on the Vehicle's Battery System.**

Before removing the original Controller take note or take a photo of the 5 Controller Posts and their corresponding Wires. Make sure that the groups of wires stay together.
Remove (A) the Vehicle Controller Cover and the Original Vehicle Controller. (B) Install the Controller using the 3 screws from the original controller.
(C) Connect the Motor Cable from the original Controller to the M Post on the Controller using a M8 Bolt, Lock Washer and Flat Washer.
(D) Connect the Main Positive Red Power Cable along with the 2 SilverWolf 4WD Positive Red Power Cables (if installed) to the B+ Post on the Controller using a M8 Bolt, Lock Washer and Flat Washer.
(E) Connect the Main Negative Black Power Cable along with the 2 SilverWolf 4WD Negative Black Power Cables (if installed) to the B- Post on the Controller using a M8 Bolt, Lock Washer and Flat Washer.
(F) Install the F1 Field Wire from the original Controller to the F1 Post on the Controller using a Spade Connector and a M6 Bolt, Lock Washer and Flat Washer. (G) Install the F2 Field Wire from the original Controller to the F2 Post on the Controller Post using a Spade Connector and a M6 Bolt, Lock Washer and Flat Washer.



Torque Specifications

F1 & F2	**6 mm Bolt**	60 in-lbs/ 5ftlbs/ 6.8Nm
B-/M/B+	**8 mm Bolt**	150 in-lbs/ 12.5ftlbs/ 16.9Nm

INSTALLATION INSTRUCTIONS

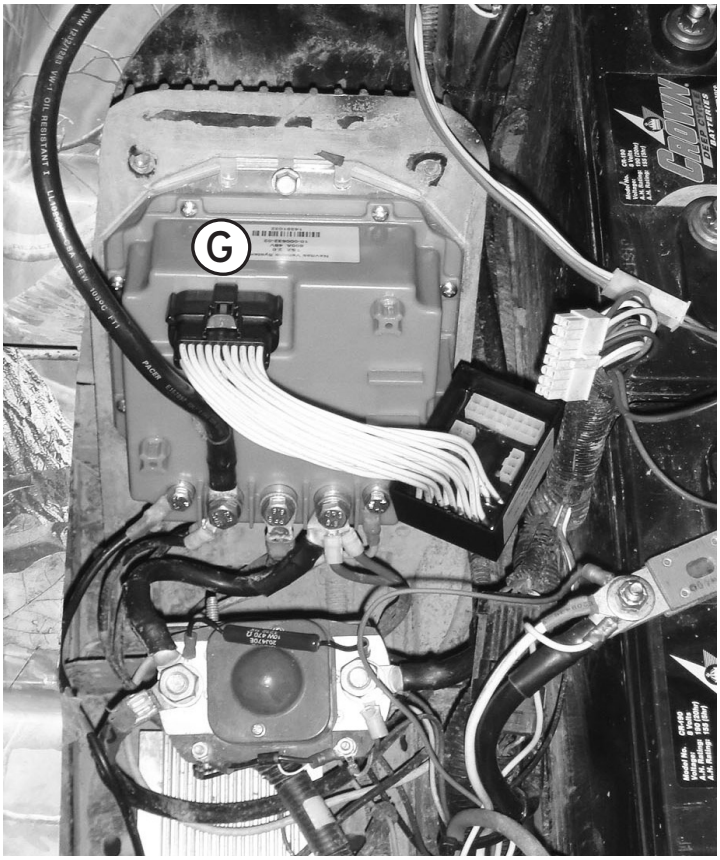
E-Z-GO TXT 48V with Curtis 1206HB Installation cont'd.

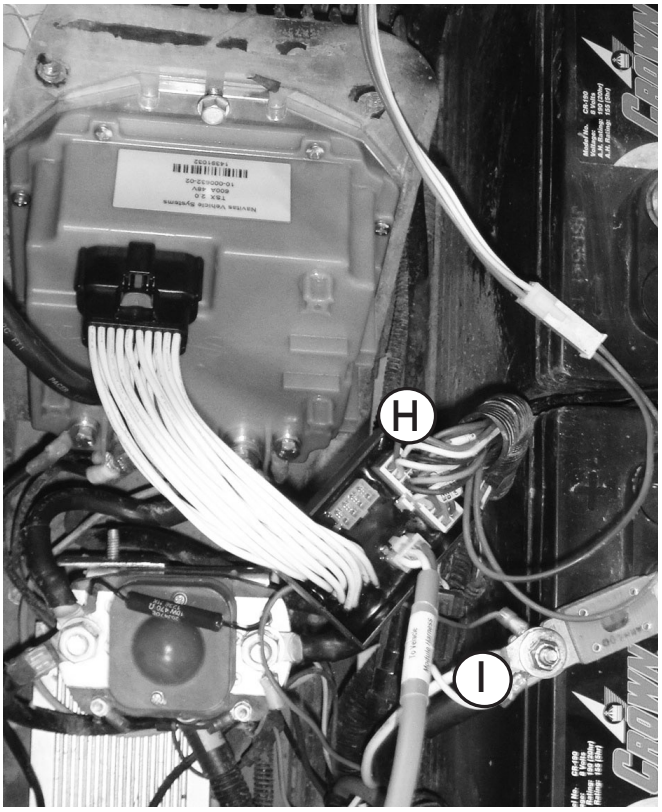
(G) Install the 20 Pin Connector on the Harness to the Controller.

(H) Install the 16 Pin Connector from the Vehicle Wiring Harness to the 16 Pin Connector on the Harness.

(I) If the Vehicle has a SilverWolf 4WD System connect the Extension Harness from the Main Harness into the 3 Pin Connector on Harness.

NOTE: The Harness should be oriented and secured with Zip Ties so that water and debris does not accumulate in the Connectors.





Now the Vehicle's Main Battery Positive and Negative Cables can be re-connected.

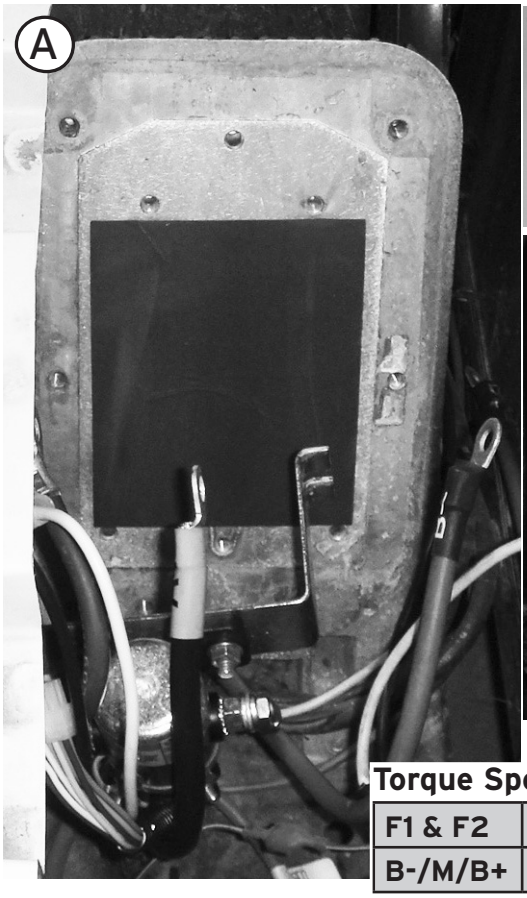
INSTALLATION INSTRUCTIONS

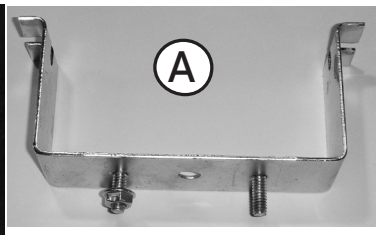
E-Z-GO TXT 36V with Curtis 1206MX Installation

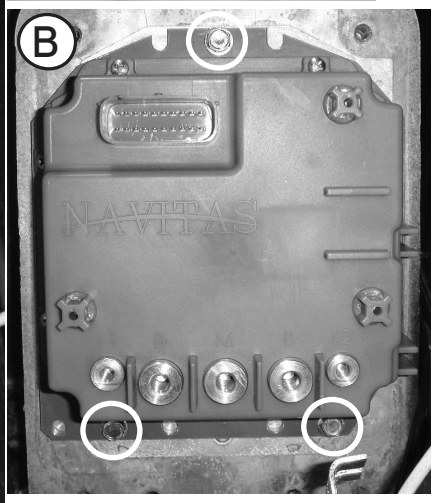
⚠ DANGER

- **Make sure the RUN/TOW Switch is in the TOW position.**
- **Make sure to Disconnect the Main Positive ⊕ and ⊖ Negative Cable on the Vehicle's Battery System.**

Before removing the original Controller take note or take a photo of the 5 Controller Posts and their corresponding Wires. Make sure that the groups of wires stay together.
Remove (A) the Vehicle Controller Cover and the Original Vehicle Controller. Remove the Solenoid Bracket from the Solenoid and the Controller Mounting Plate. Note: The Solenoid Bracket will not be re-installed.
(B) Install the Controller using the 3 screws from the original controller. Note: These Screws will be going into non-threaded holes but the Screws are self tapping Screws and will make their own threads.
(C) Attach the Solenoid using the 2 Screws from the Solenoid Bracket to the area below the Controller. Note: There are 2 holes already drilled.







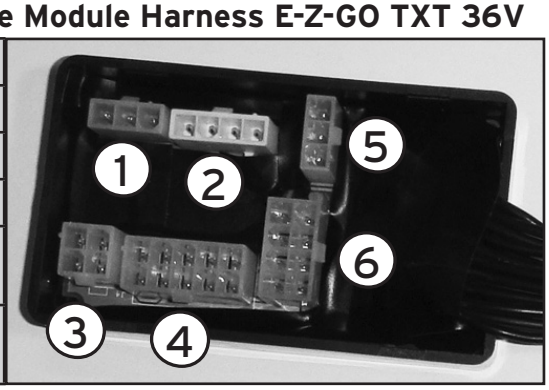
Torque Specifications

F1 & F2	6 mm Bolt	60 in-lbs/ 5ftlbs/ 6.8Nm
B-/M/B+	8 mm Bolt	150 in-lbs/ 12.5ftlbs/ 16.9Nm

Connector Plug Location

1	Vehicle	3 Pin	Vehicle Harness Connector
2	Vehicle	4 Pin	Vehicle Harness Connector
3	Vehicle	4 Pin	Vehicle Harness Connector
4	Vehicle	10 Pin	Vehicle Harness Connector
5	4WD	3 Pin	SilverWolf 4WD System-Optional (WH03500 Extension Cable)
6	OTF	8 Pin	"On The Fly" Programmer *(Optional) Not included

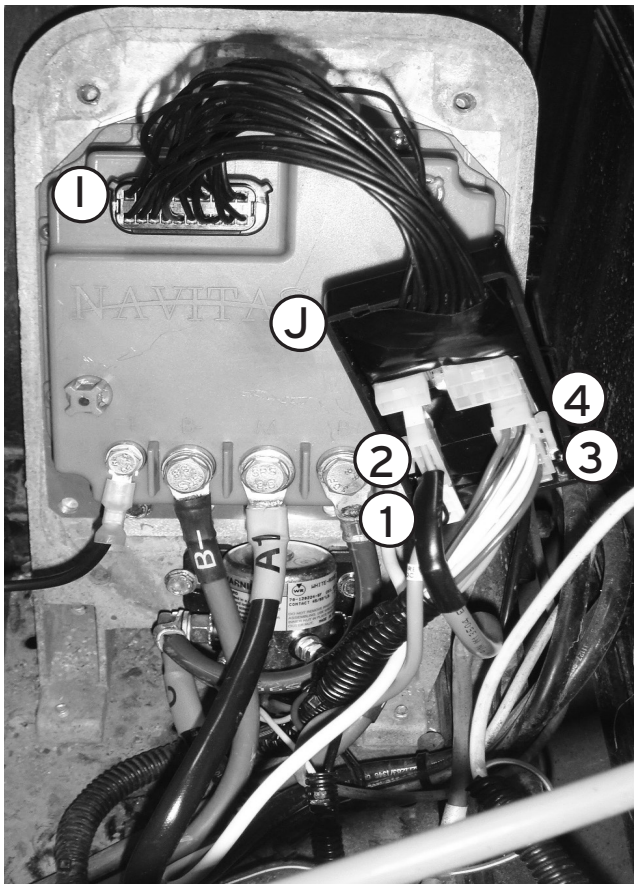
Vehicle Module Harness E-Z-GO TXT 36V

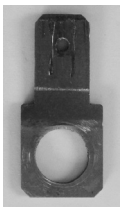


INSTALLATION INSTRUCTIONS

E-Z-GO TXT 36V with Curtis 1206MX Installation cont'd.

(D) Connect the Motor Cable from the original Controller to the M Post on the Controller using a M8 Bolt, Lock Washer and Flat Washer.
(E) Connect the Main Positive Red Power Cable from the Vehicle Solenoid to the B+ Post on the Controller using a M8 Bolt, Lock Washer and Flat Washer.
(F) Connect the Main Negative Black Power Cable to the B- Post on the Controller using a M8 Bolt, Lock Washer and Flat Washer.
(G) Install the F1 Field Wire (usually green) from the original Controller to the F1 Post on the Controller using a Spade Connector and a M6 Bolt, Lock Washer and Flat Washer.
(H) Install the F2 Field Wire (usually black) from the original Controller to the F2 Post on the Controller Post using a Spade Connector and a M6 Bolt, Lock Washer and Flat Washer.





NOTE: Use these Spade Connectors on the F2 and F1 posts.

See the "CONNECTOR PLUG LOCATION" Chart on the previous page and photo I above to connect the Vehicle Connectors to the Harness.
(I) Install the 20 Pin Connector on the Harness to the Controller.
(J) Install the Connectors from the Vehicle Wiring Harness to the Connectors on the Harness as shown in the "CONNECTOR PLUG LOCATION" Chart on the previous page.
NOTE: The Module should be oriented and secured with Zip Ties so that water and debris does not accumulate in the Connectors.
(K) If re-installing the Controller Cover with the RUN/TOW Switch the Cover, will need to be cut off at the bottom because of the new Solenoid location. Use a Saw to cut the bottom 2"'s of the Cover. Plug in the 4 pin Connector from the RUN/TOW Switch to the Harness and reinstall the Controller Cover.
NOTE: The Harness should be oriented and secured with Zip Ties so that water and debris does not accumulate in the Connectors.

Now the Vehicle's Main Battery Positive and Negative Cables can be re-connected.

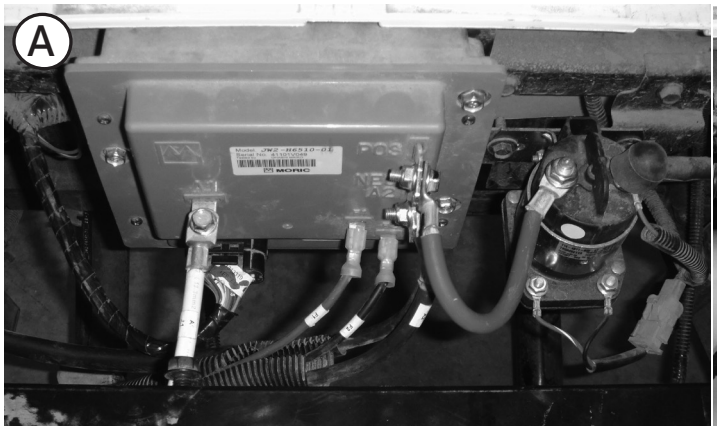
INSTALLATION INSTRUCTIONS

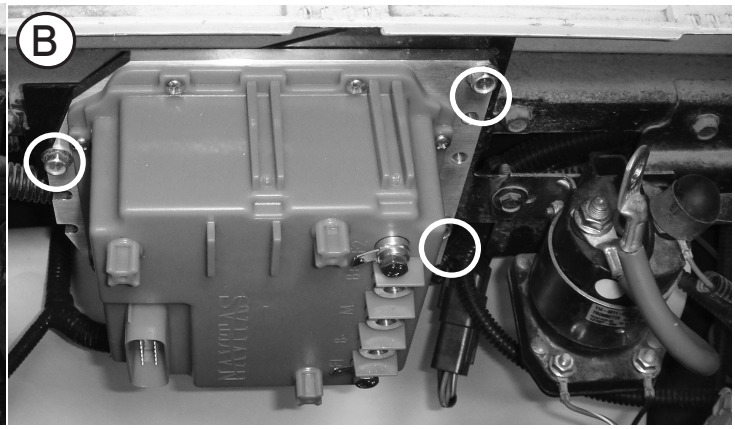
Yamaha Drive with Moric JW2 Installation

⚠ DANGER

- **Make sure the RUN/TOW Switch is in the TOW position.**
- **Make sure to Disconnect the Main Positive ⊕ and ⊖ Negative Cable on the Vehicle's Battery System.**

Before removing the original Controller take note or take a photo of the 5 Controller Posts and their corresponding Wires. Make sure that the groups of wires stay together.
Remove (A) the Original Vehicle Controller. (B) Install the Controller using the 3 screws from the original controller.
CAUTION: DO NOT CONNECT ANY WIRES OR CABLES UNTIL AFTER STEP C.



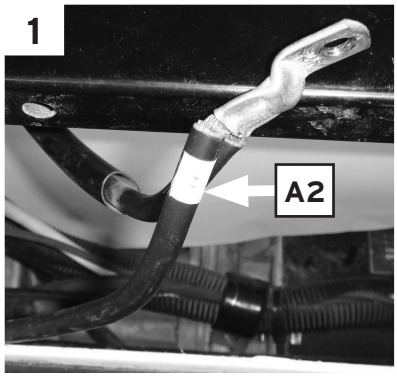


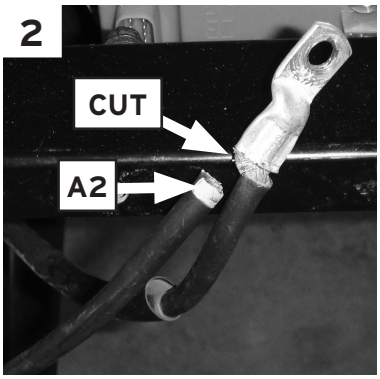
Locate (C) the Y cable on the Vehicle Harness: shown as A2 in the photo below. This cable consists of 2 cables crimped together in to a Ring Terminal. The one side comes from the Battery Negative and the other side comes from the A2 on the Motor. Use a pair of side cutters to cut the A2 side of the cable at the Ring Terminal. Then crimp on a new ring terminal (included in the Harness bag). NOTE: The Ring Terminals on the original Harness may need to be drilled out to 5/16" to allow the New Harness to beconnected to the new Controller.

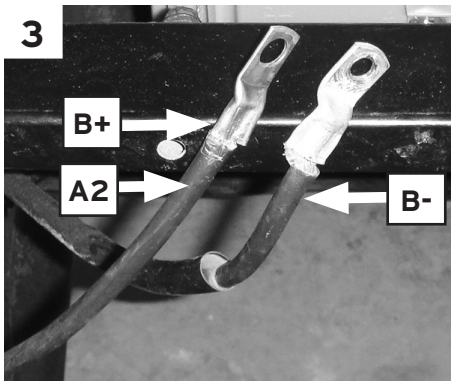
Torque Specifications

F1 & F2	**6 mm Bolt**	60 in-lbs/ 5ftlbs/ 6.8Nm
B-/M/B+	**8 mm Bolt**	150 in-lbs/ 12.5ftlbs/ 16.9Nm

C



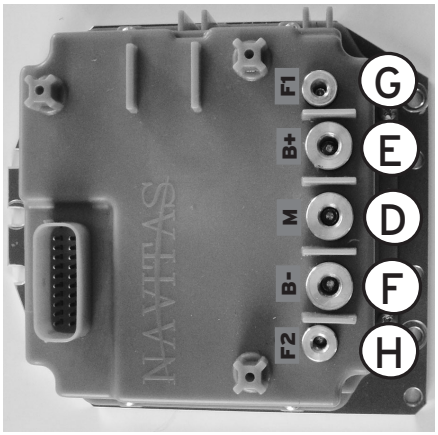


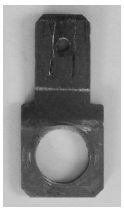


SEE PHOTO ON FOLLOWING PAGE
(D) Connect the Motor Cable (usually white) from the original Controller to the M Post on the Controller using a M8 Bolt, Lock Washer and Flat Washer.
(E) Connect the Main Positive Red Power Cable from the Vehicle Solenoid and the Black A2 Cable (Cable that was cut and has the New Ring Terminal) to the B+ Post on the Controller using a M8 Bolt, Lock Washer and Flat Washer.
(F) Connect the Main Negative Black Power Cable (Cable from the Battery with the original Ring Terminal) to the B- Post on the Controller using a M8 Bolt, Lock Washer and Flat Washer.
(G) Install the F1 Field Wire (usually green) from the original Controller to the F1 Post on the Controller using a Spade Connector and a M6 Bolt, Lock Washer and Flat Washer.
(H) Install the F2 Field Wire (usually black) from the original Controller to the F2 Post on the Controller Post using a Spade Connector and a M6 Bolt, Lock Washer and Flat Washer.

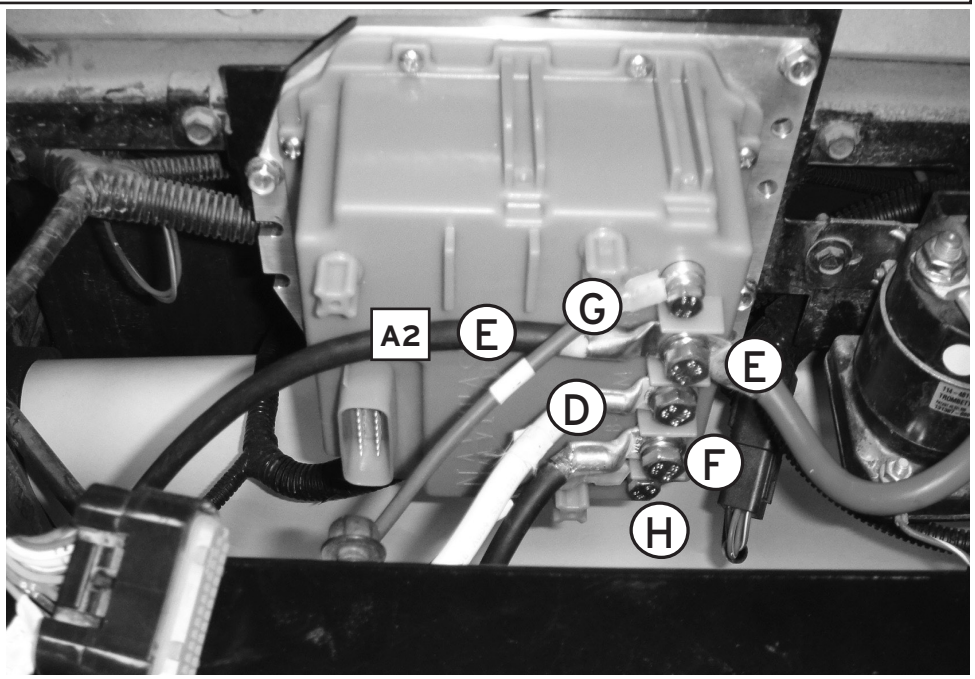
INSTALLATION INSTRUCTIONS

Yamaha Drive with Moric JW2 Installation cont'd.





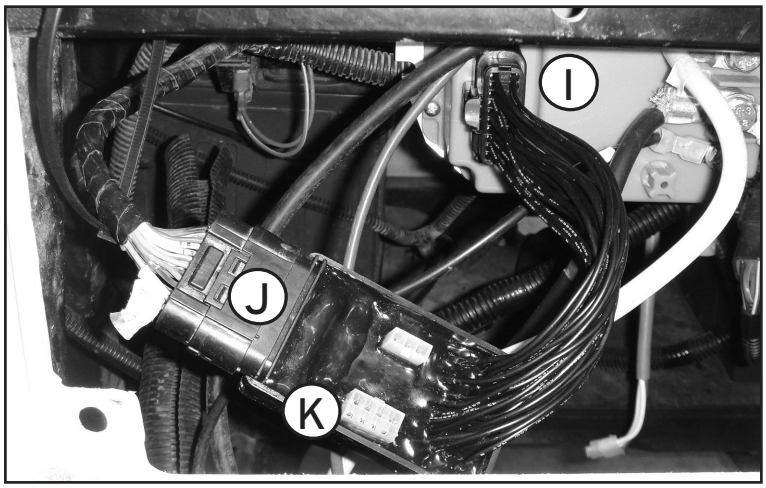
NOTE: Use these Spade Connectors on the F2 and F1 posts.



(I) Install the 20 Pin Connector on the Vehicle Module Harness to the Controller.

(J) Install the 26 PIN Connector from the Vehicle Wiring Harness to the 26 Pin Connector on the SW Vehicle Module Harness.

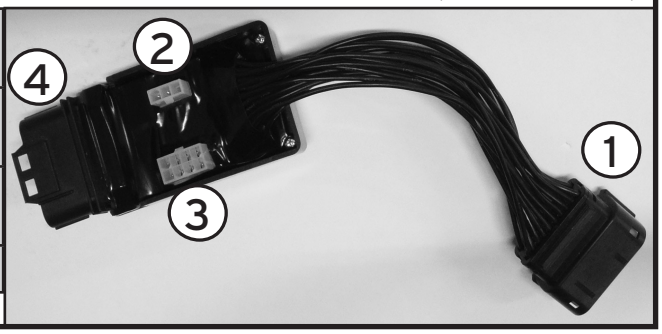
(K) This 8 Pin Connector is for the optional OTF "On The Fly" Programmer.



NOTE: The Harness should be oriented and secured with ZipTies so that water and debris does not accumulate in the Connectors.

Connector Plug Location — **SW Vehicle Module Harness (Yamaha DR.)**

1	Controller	20 Pin	Controller Harness Connector
2	4WD	3 Pin	SilverWolf 4WD System-Optional (WH03500 Extension Cable)
3	OTF	8 Pin	"On The Fly" Programmer *(Optional) Not included
4	Vehicle	26 Pin	Vehicle Harness Connector



Now the Vehicle's Main Battery Positive and Negative Cables can be re-connected.

INSTALLATION INSTRUCTIONS

OTF "On the Fly" Programmer (Optional)

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

By unlocking the programmer with the key, and adjusting the top speed, acceleration and electronic braking, the user has changed the operating behavior of the vehicle.

The user takes full responsibility when the OTF Programmer is unlocked and changes are made from the Factory Settings.

PART #10-000644
OTF1.0 Programmer

To install The OTF "On the Fly" Programmer

- First make sure the Vehicle RUN/TOW Switch is in the TOW position and the Key is turned off.
- The OTF can be mounted on the Vehicle or removed and used as required for programming purposes.
- The OTF has a long enough Cable to allow it to be mounted to the Dash area. Make sure to run the Cable in an area where it can not get pinched, damaged or wet. i.e. Under the Floor Mat in the wiring channel. Use the Velcro provided to secure it to an open area on the Dash.
- Plug the end of the OTF in to the 8 Pin connector on the Harness.

The OTF has been set to Factory Settings. When changing the settings it must be done in small increments and tested in an open area away from people, pets or large objects.

To program the desired settings into the controller:

- Turn the Lock Out Key from the Lock position to the Unlock position.
- Adjust Maximum Speed, Regen and Acceleration to desired settings.
- Turn the Lock Out Key to the Lock position to lock in the settings and remove the Key from programmer.

NOTE: The Key allows the operator to lock the settings on the Controller. Once the OTF is locked or unplugged from the Controller the settings can not be changed. The OTF setting will also change the Vehicle's Reverse operations.

Make sure to remove the key and keep it in a safe and secure spot.

On-The-Fly (OTF)Programmer – Quick Start Guide

Range Control
Use the Speed Dial to Control your Range. The lower the speed setting the further your golf car will drive. The Controller automatically reconfigures to run more efficiently at lower speeds. This can double your range.

Regenerative Braking
Control Regenerative Braking for Safety and Efficiency (Dial up or down depending on driving conditions)

Acceleration
Adjust how fast your vehicle Accelerates depending on driver preference

Status LED
Provides Diagnostic Feedback to the driver

Adjust Speed
Use this dial to set your speed limit based driving conditions

Key Lock
Lock and Unlock your settings. This disables the dials until the OTF is unlocked (ideal way to control the behavior of the golf cart based on owner preferences)

Use the OTF Programmer to Toggle between Series and Shunt golf cars
The Navitas Controllers are designed to work with both Series and Shunt Motor Systems – OTF Required (instructions are located in the owners manual)

INSTALLATION INSTRUCTIONS

Controller Pre-Drive Test:

⚠ CAUTION: All 4 Wheels MUST be off the ground!

1. **Move the Run/Tow Switch to the Run position.**
2. **Insert and turn Key to ON**
3. **Move Vehicle's FNR switch to the Forward position.**

⚠ **Caution: the F1 and F2 Wires could be reversed do to Vehicle Wiring and may cause the vehicle to move in the opposite direction as shown on the Switch.**

4. **Step on the Accelerator to test that the Vehicle is operating. Repeat this test with the switch in the Reverse position.**

If the Rear Wheels of the vehicle are not running properly during the Pre-Drive Test see the chart below to test the Vehicle Switches.
NOTE: On the OTF the LED will flash once when the Key, Forward, Reverse, or Foot Switch is activated and at 100%.

The following test procedures are to show that the Controller is getting the correct signals.
If a OTF Programmer was not purchased the Vehicles Reverse Buzzer will beep (if it is connected) and this can be used for the test procedures.

CONTROLLER INPUT SIGNAL CHECK

TEST		ACTION	RESULT	YES	NO
1	Key Switch	Turn Key Switch to ON	1 Green Flash/ Beep	OK	Replace Key Switch
2	Forward	Move Switch to Forward	1 Green Flash/ Beep	OK	Replace FNR Switch
3	Reverse	Move Switch to Reverse	1 Green Flash/ Beep	OK	Replace FNR Switch
4	Foot Switch	Slowly depress the Accelerator	1 Green Flash/ Beep	OK	Replace Throttle Sensor/ or Throttle
5	100% Throttle	Continue to depress Accelerator to Floor.	1 Green Flash/ Beep	OK	Replace Throttle Sensor/ or Throttle

Controller Drive Test:

⚠ **Caution: Before taking the Vehicle for the "Final Run Test" check for any loose wires or parts that could get caught or damaged.**

This test will show that the Controller is installed and running correctly.

BEFORE YOU RUN THE FINAL TEST COMPLETE THE FOLLOWING STEPS:

1. Lift the Vehicle to allow the Jack Stands to be removed and the Vehicle to be lowered back to the ground.
2. Make sure the area around the Vehicle is clear; No people, children, pets, or objects that could come in contact with the Vehicle.
3. Move the Run/Tow Switch to Run
4. Turn the Key to Run and dis-engage the Parking Brake
5. Drive the Vehicle to an open area. Slowly Accelerate allowing time to get use to the extra power.

TROUBLESHOOTING

DANGER **Failure to follow the Warnings in this Manual can damage the Vehicle and/or cause SERIOUS INJURY OR DEATH.**
Service of the Controller Must be done by a trained golf car technician.

Before troubleshooting the Controller;

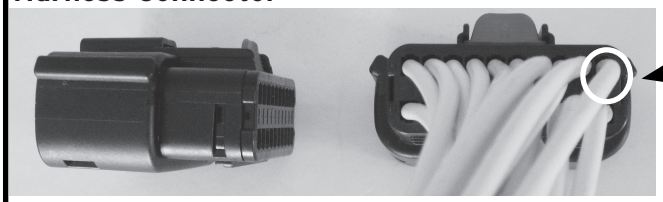
- Make sure the Run/Tow Switch is in the Tow position
- The Key is turned OFF
- Make sure ALL four wheels are off the ground and the vehicle is supported with jack stands.
- The Controller is sealed and can not be opened for service. Opening the Controller will Void the Warranty

PRELIMINARY TROUBLESHOOTING

Tools Required:

Digital Multimeter

Harness Connector



This Connector is part of the Harness that is attached to the Controller.

ISSUE	POSSIBLE CAUSES	HOW TO CHECK
Vehicle/ Controller does not power up.	• RUN/TOW off. • Discharged/ Bad Batteries • Wiring and Connectors	• RUN/TOW Switch in RUN position. • Check Battery Pack voltage (It needs to be at least 31V to power up) • Check All Wires for damage or loose connections. • Check that the pins are fully seated in the Connectors (by tugging lightly on the individual wires) and that the Connectors are fully seated and locked into place.
	• Correct voltage at Controller	• Check the voltage at the Controller between B+ and B- (it should be the pack voltage). • Check the voltage between Pin 10 of the Vehicle Module Harness's 20 Pin Connector and the B-. (it should be pack voltage).
	• Faulty Harness	• Replace Harness

If there is pack voltage at the Controller between B+, Pin 10 and B- replace the Controller and re-test.

FLASH CODE TROUBLESHOOTING

This Controller has both a **GREEN LED** and a **RED LED Status Light** that will indicate the status of the Controller.
It is located inside the Controller and is visible through the Top Cover when the Controller is powered.
Note: The vehicle's reverse buzzer will also chirp the flash code in the event of a fault.
Note: If the Optional "On the Fly" Programmer was purchased it is also equipped with a **GREEN LED Status Light**. This light will indicate the same Flash Codes except they will be in **GREEN** only.

LED STATUS LIGHT CHART

● = SOLID ✺ = FLASHING

GREEN LED

GREEN	VEHICLE STATE	MODE	STATUS	
✺ x2	KEY OFF	Standby	☑	Turn Key ON
●	KEY ON	Ready	☑	Ready to use!

RED LED

RED	VEHICLE STATE	MODE	STATUS	
✺	See Flash Code Chart Next Page	Error	☒	Fault!

RED LED Status Light contains a 2 digit code;

EXAMPLE: ✺ **1 SEC** ✺✺ **= 1 - 2 Flash Code**

NOTE: There will be a 2 second pause before the error code repeats itself.

TROUBLESHOOTING

FLASH CODES	FLASH CODE MESSAGE	DESCRIPTION	SOLUTION	HOW TO CHECK
1 - 1	**Voltage Issue: Batteries**	Batteries are empty or too low.	• Recharge Batteries • Check for bad or damaged Batteries. • Check Battery Cables are not loose or damaged. • Check Solenoid	• Use a Battery Load Tester to verify Battery condition after charging. • Connect Volt Meter to Main ⊕ and ⊖ on the Batteries. (Use alligator clips). Measure the voltage while driving to see if the voltage drops. • Attach Volt Meter to ⊕ and ⊖ on the Controller if the voltage drops at the Controller and not at the Battery then the Solenoid may be bad.
1 - 1	**Voltage Issue: Batteries**	Batteries too full	• Batteries can not take a charge. Check the Batteries, one or more Batteries may be bad.	• Use a Battery Load Tester to verify Battery condition after charging.
1 - 1	**Voltage Issue: Solenoid (Contactor)**	Damaged Solenoid or loose Wiring	• Confirm the Solenoid is working properly. Change Solenoid if required.	• Put vehicle in Neutral. Measure Voltage on main posts (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 posts. Replace solenoid. • 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.
1 - 2	**Temperature (Controller)**	Performance is limited because the Controller is Hot.	• Let Vehicle cool off; system is over worked.	• Check the temperature of the Controller with a non-contact temperature sensor.
1 - 3	**Charger Interlock**	Charger is connected. Vehicle Charging Port may be wet Club Car On Board Computer (OBC) is in sleep mode.	• Disconnect the Charger before trying to move. • Dry and clean the Charger Port • Depress the throttle twice to wake up OBC. • Replace Charger port on Vehicle	
1 - 4	**Temperature (Motor)**	Performance is limited because the Motor is Hot.	• Let Vehicle cool off; system is over worked.	• Check the temperature of the Motor with a non-contact temperature sensor.
1 - 5	**BDI (**Battery Discharge Indication)	The Battery level is less than 20% SOC (State Of Charge)	• Charge the Batteries	• The Vehicle will automatically be put into Low Speed Mode **Warning!** Continued use may damage the batteries.
2 - 1	**Switch Fault**	Both FWD & REV signal came on at the same time.	• Check and replace FWD & REV Switch	• Check the FNR Switch. Does the Switch feel the same when toggled from FWD to Neutral to REV? If so check continuity of the Switch.

TROUBLESHOOTING

FLASH CODES	FLASH CODE MESSAGE	DESCRIPTION	SOLUTION	HOW TO CHECK
2 - 2	**Main Solenoid (Contactor)**	Solenoid Coil takes too much current.	• Check for loose Wires or a short across Small Terminals on the Solenoid. • Replace main Solenoid.	• Check for loose Wires. If there is a Diode across the Solenoid check that it is not shorted. • 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.
2 - 3	**Reverse Buzzer / OTF LED**	Over current on the Reverse Buzzer / OTF LED circuit.	• Find and correct the short circuit. • Replace the Reverse Buzzer • Replace the OTF • Replace the Main Solenoid	• Unplug OTF and check if the Flash Code Error stops on the Controller. • Check for a short circuit in the wiring near the Reverse Buzzer or in the Buzzer itself.
2 - 4	**Controller not pre-charging**	Abnormally low voltage on the Controller between B+ and B-.	• Clean and dry off the Controller • Check voltage	• Visually check for debris or moisture on Controller Terminals and Wires (There may be a short across the B+ and B- posts). • Check the voltage between B+ and B- on the Controller. It should equal the Battery Pack Voltage.
			• Check all Wires connected to the Controller	• Check that the Wires are not damaged. • Check that the B+ and Field Wires are not shorted to the Frame or each other. (B+ -/F1, B+/F2, F1/F2) • Check that no accessories (Light Kits, Stereos, etc.) are using the Frame as a ground.
2 - 5	**Controller not pre-charging**	Cables /Controller	• Test Cables at the Controller **<u>DO NOT</u> 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!**	• Remove all Cables except B- from the Controller. • Tape Cables so they do not touch each other or the Vehicle Frame. Controller Harness should remain pluggedinto the Controller. • Move Run/Tow Switch to Run, Turn on Key Switch, depress the throttle. If 2-4 Flash Code returns replace the Controller. • Otherwise there is a Wiring problem. Reconnect Wires one at a time (Turn off RUN/TOW Switch each time) until 2-4 Flash Code returns. This will indicate where the Wiring issue is located.
2 - 6	**Accelerator**	The Accelerator signal is out of range. This can be caused by a faulty connection or a defective Accelerator Assembly	• Check Accelerator Wires, Harness and Accelerator	• Check Accelerator Wires and Connections. • Measure the voltage between the main B- and Pin # 2 (center pin) on the 3 pin 4WD connector in the Harness. The Voltage should start near 0Vand move up to a maximum of 5V. If notreplace Throttle Sensor. i.e. MCOR, ITS, etc.

TROUBLESHOOTING

FLASH CODES	FLASH CODE MESSAGE	DESCRIPTION	SOLUTION	HOW TO CHECK
2 - 7	**Loss of Field Current**	Controller is unable to create field current in the Motor.	• Check your Motor field (F1 & F2) Wiring.	• Check that the Field Wires (F1 & F2) on the Motor and Controller are tight and not damaged. • Measure the voltage across F1 & F2 while trying to drive the Vehicle. If Meter shows full Battery Voltage across F1 & F2 then check Wires and resistance across F1 & F2 of Motor with Wires disconnected. Should show a resistance of around 1 ohm. High ohm reading suggest faulty Motor and/or Wiring.
2 - 8	**Internal**	Internal Issue	• Reset the Controller by turning off the key and moving the Run/Tow switch to Tow then back to Run. Test the vehicle to see if issue continues. • Return the Controller to your Dealer / Navitas Vehicle Systems Ltd. for a Complimentary Diagnostic.	

NON-FLASH CODE TROUBLESHOOTING

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.	• Batteries are discharged • Bad or damaged Motor • Faulty Speed Sensor • Faulty Throttle • OTF programmer is locked at low speed	• Re-charge the Batteries • Check Motor • Unplug Speed Sensor • Raise the Vehicle so all wheels are off the ground. Depress Throttle and look for green flash on OTF Programmer when the Throttle is almost completely depressed. • Connect the OTF Programmer, unlock it and adjust to desired speed. Note: Lock OTF Programmer before removing it or the settings may change.
Vehicle is shutting down.	• Check Vehicle Wiring for loose connections • Check the OBC (On Board Computer)	• Check the OBC by referring to the "OBC section" in the manufacturers service manual.
Oscillations or bumpy feel when driving.	• Motor compatibility	• Check that the Motor is on the Navitas recommended Motors list
Vehicle feels sluggish after driving for a while.	• Battery Cables are undersized	• Upgrade the Power Cables to at least 4AWG.
Faulty Controller	• Controller malfunction	• Use a Digital Multimeter set to Diode mode →| • Remove all Wires and Cables on Controller • Use "Controller Diode Test" Chart below to test the Controller

CONTROLLER DIODE TEST CHART

BLACK LEAD ⊖	RED LEAD ⊕	VOLTAGE →|	BLACK LEAD ⊖	RED LEAD ⊕	VOLTAGE →|
B+	M	0.42V approx.	F2	B-	0.48V approx.
M	B-	0.42V approx.	B+	F1	0.48V approx.
F1	B-	0.48V approx.	B+	F2	0.48V approx.

TROUBLESHOOTING

OTF TROUBLESHOOTING

ISSUE	CAUSE	HOW TO CHECK
OTF Knobs do not change the Controller settings.	• OTF is Locked 🔒 • OTF Connector • • OTF Faulty	• Use Key to unlock 🔓 OTF to adjust Controller settings. • Check that the 8 Pin Connector on the OTF is plugged in to the Harness • Replace OTF or return for service.
Settings are not changing	• OTF not locking in new settings	• After adjusting the knobs to the desired settings, move the OTF Key from the 🔓 UNLOCK to the 🔒 LOCK position. The 🔒 LOCK position saves the current settings to the Controller. The OTF may now be unplugged and removed from the Vehicle.

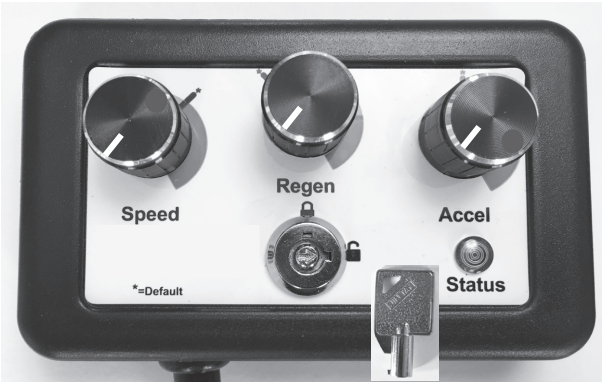
NOTE: The Maximum Speed of the Golf Cart will depend on the following;
- Tire size (Bigger tires will increase speed)
- Motor type/Condition (Is it a High Speed or Heavy Duty Motor)
- Batteries/condition of the battery pack.
- Battery Cables and Connections (resistance points on the connections) ie thick enough cables and good clean connections)

To prevent corrosion it is recommended to protect the Vehicle Module and Battery Cable Connections with Dielectric Grease.

OTF/CONTROLLER CONFIGURATION INSTRUCTIONS

1 SWITCHING THE CONTROLLER TO CONFIGURATION MODE:

Note: This can only be done on Controllers with SW 8.2 or greater.



A) The RUN/TOW Switch is in RUN, Key Switch is ON and the Vehicle is in Neutral.

B) Turn the Lock Out Key from the 🔒 Lock position to the 🔓 Unlock position.

C) Turn all Knobs down to the **Minimum** settings.

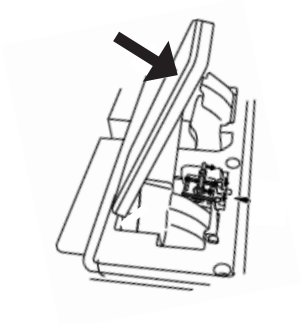
D) Turn the Lock Out Key from the 🔓 Unlock position to the 🔒 Lock position **5** times. Stop at the 🔓 Unlock position.

E) The Green OTF Status Light will flash ✺ **5** times. Note: the Reverse Buzzer will also Beep 5 times.

The OTF is now in Configuration Mode.

2 CALIBRATING THE THROTTLE:

Recommended for best Throttle response on all Carts.



A) Depress the Throttle **5** times. Smoothly through its entire motion.

B) The Green OTF Status Light will flash ✺ **3** times to confirm Throttle calibration.

C) Turn the Lock Out Key from the 🔓 Unlock position to the 🔒 Lock position.
The OTF LED will flash ✺ **2** times to confirm that the Controller has saved the new settings and is no longer in the Configuration mode.

⚠ **The OTF has been set to Factory Settings. When changing the settings it must be done in small increments and tested in an open area away from people, pets or large objects.**

ACCESSORIES

OTF "ON THE FLY" PROGRAMMER

RECOMMENDED FOR OPTIMAL PERFORMANCE

PART #10-000644
OTF1.0 Programmer

- Driver can adjust the Acceleration, Regeneration, and Top Speed of the vehicle in Real Time.
- Valet Lockout allows the owner to set and key-lock the operating behavior of the vehicle.
- Simple diagnostics
- Easy for the dealer/operator to diagnose the most common vehicle issues (low battery voltage, defective throttle, bad FWD/REV switch, faulty key switch, etc.)
- Plug and Play installation
- Speed adjustability On the Fly from 4 to 23 mph (Depending on Tire Size, Battery Condition and Motor Type).

Warranty

Document# 05-000101

Limited Warranty

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, TSX 2.0, 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

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 andsuch 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 and shall specify such use at the time of the placement of any order for a Navitas product. Navitas shall be entitled to rely exclusively upon such representation in furnishing any product to Customer.

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.

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