ClipperCreek, Inc
11850 Kemper Rd., Suite E
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ClipperCreek, Inc.

Innovative Infrastructure for Electric and Hybrid Vehicles

User's Manual

Model TS-70

PLEASE NOTE

This user's manual includes the latest information at the time of printing. ClipperCreek, Inc. reserves the right to make changes to this product without further notice. Changes or modifications to this product by other than an authorized service facility could void the product warranty.

If you have questions about the use of this product, contact your Service Representative.

TS-70 User's Manual, Version 14, November, 2008
TS-70 User Manual DLP v14 081130.pmd

Notes

CUSTOMER SUPPORT

Call your Service Representative at any time, 24 hours a day, at the number below. **PLEASE HAVE THE MODEL NUMBER AND SERIAL NUMBER AVAILABLE WHEN YOU CALL.** These can be found on the side of the enclosure. If your call is made after business hours or on weekends, please leave your name, telephone number, the unit's serial number, and a brief description of the problem. A Service Representative will call back at the earliest opportunity.

Distributor
Place Contact Information
Sticker Here.

MAINTENANCE

The TS-70 requires no periodic maintenance other than occasional cleaning.

Warning To reduce the risk of electrical shock or equipment damage, do not allow liquid to enter the unit while cleaning it.

1. Turn off your charge station at the circuit breaker before cleaning.
2. Clean your charge station using a soft cloth lightly moistened with mild detergent solution. Never use any type of abrasive pad, scouring powder, or flammable solvents such as alcohol or benzene.

Please visit ClipperCreek's Website @ www.clippercreek.net

CONTENTS

IMPORTANT SAFETY INSTRUCTIONS

Carefully read these instructions and the charging instructions in your vehicle owner's handbook before charging your electric vehicle.

The following symbols may be found in your handbook or on labels affixed to your conductive charge station:

Note *This means pay particular attention.* Notes contain helpful suggestions.

Caution *This symbol means be careful.* You are capable of doing something that might result in damage to equipment.

Warning *This symbol means danger.* You are in a situation that could cause bodily injury. Before you work on any electrical equipment, be aware of the hazards involved with electrical circuitry and standard practices for preventing accidents.

Safety Guidelines

Use this charge station to charge electric vehicles equipped with a *conductive charge port only*. See the vehicle's owner's handbook to determine if the vehicle is equipped with a conductive charge port.

Make certain the charge station's supply cable is positioned so it will not be stepped on, tripped over, or otherwise subjected to damage or stress.

There are no user serviceable parts inside. Refer to the Customer Support section in this manual for service information. Do not attempt to repair or service the charge station yourself.

Do not operate your charge station with a visibly damaged supply cable or charge station. Contact your Service Representative for service immediately. Refer to the Customer Support section in this manual for information on the Service Representative in your area.

This limitation applies to damages of any kind including any direct or indirect damages, lost profits, lost saving or other special, incidental, exemplary or consequential damages whether for breach of contract, tort or otherwise or whether arising out of the use of or inability to use the product, even if ClipperCreek or an authorized ClipperCreek representative or dealer has been advised of the possibility of such damages or of any claim by any other party. Some states do not allow the exclusion or limitation of incidental damages for some products, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state.

To obtain warranty service:

Call your nearest authorized Service Representative or ClipperCreek at the above number. You will receive information as to how service for the product will be provided.

If you mail or ship the product in for service, you must insure the product, prepay all shipping charges, and properly pack it for shipment in its original shipping container or its equivalent. You are responsible for all loss or damage that may occur in transit.

You must provide proof of purchase of the product and the purchase date before any warranty service can be performed.

WARRANTY INFORMATION

LIMITED WARRANTY – ELECTRIC VEHICLE SUPPLY EQUIPMENT
MODEL TS-70
ClipperCreek, Inc.
11850 Kemper Road
Auburn, California 95603

ClipperCreek shall provide the following warranty with respect to the Products to Representative, its Sub-Representatives and their customers:

Product 1-year parts, 1-year factory labor,

ClipperCreek, Inc. warrants this product to be free from defects in material and workmanship. The warranty period shall commence on the date of installation date (first use). The product installation date must be evidenced and communicated to ClipperCreek by way of the warranty registration card (or its equivalent). The warranty registration card must be filled out completely and accurately, and returned to ClipperCreek within 30 days after installation, and the product installation date shall be within 6 months after the purchase date. If a Product installation date is not communicated to ClipperCreek as described above, the product purchase date shall serve as the warranty commencement date.

If this product is defective in materials or workmanship during the warranty period, Clippercreek will, at its option, repair or replace the product. Repair parts and /or replacement products may be either new or reconditioned at ClipperCreek's discretion. This limited warranty does not cover service or parts to repair damage due to improper installation or use, including but not limited to improper connections with peripherals, external electrical faults, accident, disaster, misuse, abuse or modifications to the product not approved in writing by ClipperCreek. Any service repair outside the scope of this limited warranty shall be at applicable rates and terms then in effect.

All other express and implied warranties for this product including the warranties of merchantability and fitness for a particular purpose, are hereby disclaimed. Some states do not allow the exclusion of implied warranties or limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

If this product is not as warranted above, your sole and exclusive remedy shall be repair or replacement as provided above. In no event will ClipperCreek, any of its authorized sales and Service Representatives, or its parent company be liable to customer or any third party for any damages in excess of the purchase price of the product.

Warning: Turn off input power to your charge station at the circuit breaker panel before servicing or cleaning the unit.

Note VENTILATION: Some electric vehicles require an external ventilation system to prevent the accumulation of hazardous or explosive gases when charging indoors. Check the vehicle's owner's handbook to determine if your vehicle requires ventilation during indoor charging.

Those vehicles which follow the SAE J1772 standard for communication with the charging station can inform the TS-70 that they require an exhaust fan. The TS-70 is not equipped to control ventilation fans. If an exhaust fan is requested, the TS-70 will not charge the vehicle. If this function is required, ask your ClipperCreek representative for information on other products which have the exhaust fan control feature.

Caution: DO NOT charge your vehicle indoors if it requires ventilation. Contact your Service Representative for information.

FCC INFORMATION

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

This product has been designed to protect against Radio Frequency Interference (RFI). However there are some instances where high powered radio signals or nearby RF-producing equipment (such as digital phones, RF communications equipment, etc.) could affect operation.

If interference to your charge station is suspected, we suggest the following steps be taken before consulting your ClipperCreek Sales and Service Representative for assistance:

1 Reorient or relocate nearby electrical appliances or equipment during charging.

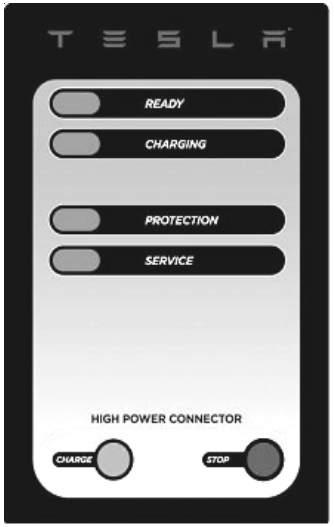
2 Turn off nearby electrical appliances or equipment during charging.

Caution Changes or modifications to this product by other than an authorized service facility could void FCC compliance.

OPERATION

The TS-70 Electric Vehicle Supply Equipment (EVSE) is a conductive charge station that provides the electric vehicle (EV) user with a safe and manageable link between the power grid and the electric vehicle.

Figure 1. The TS-70 Front Panel



Front Panel

The TS-70 is very easy to use. Verify the Green READY light is on, indicating there is power to the EVSE. Remove the charging connector from its holder, and plug it into the vehicle's charge port. If there is a mechanical latch that holds the connector firmly while charging, be sure the latch has "clicked" into place. Normally, the vehicle will immediately request a charge, the Amber CHARGING light will come on, and charging will begin. After an average driving day, it will require several hours to recharge completely. Charging overnight is the most convenient way to ensure the vehicle's full range will be available for the next day.

If the vehicle has stopped charging, the Amber CHARGING light will be out and the Green Ready light will be on. Remove the cable and you're ready to use the vehicle. If the charging is still in progress, first push the Red STOP button on the TS-70's front panel. Now you can remove the connector.

The front panel of the TS-70 also has two Red indicator lights to indicate it has detected a fault, or the unit needs service. The operational state of the unit can be known just by looking at the panel lights, and comparing them with Table 1 on page 4.

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Table 1. Front Panel Indicators

State	Green Ready Light	Amber Charging Light	Red Protection Light	Red Service Light	Condition
1	off	off	off	off	No service power
2	on	off	off	off	TS-70 has power, the EV is not connected
3	on	off	off	off	EV is connected but is not requesting a charge
4	on	on	off	off	Charging enabled, power is applied to vehicle
5	on	blink	off	off	Cold load pickup mode press start to bypass
6	on	off	off	On-Static	Ground Monitor Interupt
7	on	off	On-Static	off	Charging Fault on Vehicle
8	on	off	1 blink	off	Ground Fault on Vehicle
9	on	off	2 blinks	2 blinks	Service Needed Contact your Service Rep.
10	on	off	3 blinks	3 blinks	Service Needed Contact your Service Rep.
11	on	off	4 blinks	4 blinks	Service Needed Contact your Service Rep.
12	on	off	5 blinks	5 blinks	Service Needed Contact your Service Rep.

In Case of Difficulty

ClipperCreek recognizes that this Charging Station will be heavily relied upon to charge your electric vehicle for daily transportation needs. Therefore, every effort will be made to restore service should problems arise.

In the event of a problem, charging will stop and either the Red PROTECTION or Red SERVICE light will come on. If this happens, please try the simple steps below before calling your Service Representative.

1 Press the start button to restart charging.

2 If the unit remains in fault mode, remove the cable connector from the vehicle socket. The Red light may go out. If it *does* go out, plug the connector back into the socket, and see if charging begins normally.

3 If the Red light *does not* go out when the connector is removed, be sure the connector is removed from the vehicle socket and switch off power at the circuit breaker feeding power to the TS-70. Wait a few seconds and switch the circuit breaker back on again. If the Red light does not come back on, re-connect the cable to the vehicle. Charging should begin normally. If charging does not begin, or if the Red light comes back on, call your Service Representative.

FEATURES

Personal Protection System

Ground Fault protection with Self-Testing and Auto-Reclosure (see below), no manual resetting or testing is necessary.

Ground Monitoring Circuit

Constantly checking for the presence of a Safety Ground connection.

Auto-Reclosure

If a problem occurs that interrupts charging, the unit will automatically clear all error indications and attempt to begin charging again. If the problem is immediately sensed a second time, it will wait another 13 minutes and try again. This process will repeat several times, at which point power will be removed and no further attempt will be made. The appropriate error light will be lit on the front panel.

This feature helps ensure that your vehicle will be charged and ready for use when needed. Temporary problem indications such as ground-faults or utility power surges can be overcome automatically without user action.

Cold Load Pickup

This feature is built-in to the TS-70, but will only be apparent when the utility power fails during charging. If the charging connector is still plugged into the vehicle when utility power is restored, the Amber CHARGING light will blink and the unit will not energize the cable for a random time between 2 and 12 minutes. This is to prevent the utility's grid from experiencing a large surge at turn-on, allowing EV's in the area to begin drawing current at random times rather than all at once. If the user desires, charging can be resumed by pressing and holding the Start Button.

Note: The vehicle does not need owners attention after a power outage. The TS-70 will automatically resume charging when power is restored.

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SPECIFICATIONS

Line Input Power - Service Entrance

Voltage & Wiring	240V AC single-phase - L1, L2, and Safety Ground 208V AC 3-phase, wye-connected - Any 2 phases, and Safety Ground 240V AC 3-phase, delta-connected. With center-tap on one leg, must use only the two phases on either side of the center-tap. The two phases must both measure 120V AC to ground. **Do not use the third leg (208V "stinger").**
Current	90A Circuit Breaker. The maximum current for the vehicle is 70A, set by the duty cycle of the Pilot waveform.
Frequency	60 Hz
Output Power	Variable depending on vehicle. Vehicles will be limited to 70A. At 240V, this will be 17 KW
Dimensions	
Height	363 mm (14 in)
Width	432 mm (17 in)
Depth	152 mm (6 in)
Color	Gray
Cable Length	approximately 7.6 m (25 ft)
Weight (with Cable)	21 kg (47 lbs)
Environment	
Operating Temperature	-40°C (-40°F) to +50°C (+122°F)
NEMA Rating	NEMA 4 - outdoor use, watertight.
Agency Approvals	UL and CSA Listed, FCC Part 15

INSTALLATION

Service Connections

Caution **This is a single-phase device. Do not connect all 3 phases of a 3-phase feed !!!** You may use any two phases of a 3-phase wye-connected feed. The center-point of the 3 phases (usually used as Neutral) must be grounded somewhere in the system. A current-carrying Neutral is not needed by the TS-70. Only Line 1, Line 2, and Ground are required, as shown in Fig 3.

Caution The two phases used must each measure 120V to Neutral. Earth Ground must be connected to Neutral at only one point, usually at the Service Entry Breaker Panel.

Caution If a 240V 3-phase feed is from a Delta-connected secondary, the leg used must have a center-tap. That tap must be Grounded. Only the two phases either side of the center-tapped leg can be used. See Fig. 4 below.

Caution **Warranty is void if this unit is wired improperly**

Warning Only a qualified electrician should perform the installation. The installation must be performed in accordance with all local electrical codes and ordinances.

Only 3 wires are connected, but care must be taken that the service transformer secondary connection is definitely known, and the 3 wires from the main circuit breaker panel are connected and labeled correctly. Figures 2, 3, and 4 below show the most common service transformer secondary wiring formats.

Notice that L1, L2, & Gnd are labeled on each diagram. Those transformer outputs correspond to the same inputs on the TS-70. Also, each of the two 3-phase diagrams shows an L3 output, which *is not used*. ***Do not connect all three phases of a 3-phase secondary to the TS-70. This is a single-phase device.***

The Neutral at the service panel *must* be connected to earth ground *somewhere* in the system on *any* of the three connection arrangements. Ground-fault protection is not possible unless the Neutral (center-tap on the service transformer) is connected to an earth ground. If no ground is provided by the electrical service, a grounding stake must be driven into the ground nearby, following local electrical codes. The grounding stake must be connected to the ground bar in the main breaker panel, and Neutral connected to ground at that point.

Warning Local electrical codes must always be followed when installing the grounding stake.

The following diagrams illustrate the 3 service transformer secondary connections most common in the United States.

Figure 2. 220/240V Single Phase

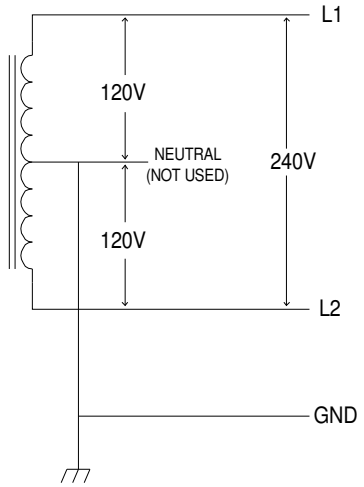
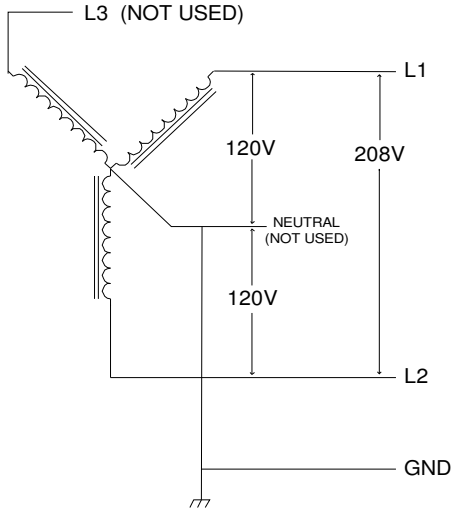


Figure 3. 208V 3-Phase, Wye-Connected



FOR THE SERVICE TECHNICIAN

GFCI Trip: When the unit has detected a ground fault the contactor will open and the front panel Red PROTECTION light will be lit. The system waits 13 minutes after sensing a fault, then automatically attempts recovery. After several such attempts, the TS-70 will stay in the Protection mode and the Red PROTECTION light will remain blinking.

If a ground fault error or an EV connection error has been detected:

1 Remove the EV connector from the vehicle

2 Inspect the connector and the vehicle's charge port. Be sure they are clean and undamaged.

3 Reconnect to the vehicle. If the fault condition persists, a problem may exist on the vehicle.

4 Refer to the vehicle owner's manual for instructions on inspecting and cleaning the charge port.

5 Plug the EV connector back into the vehicle.

6 If the ground fault error is still detected, contact your Service Representative.

Ground Missing: Red SERVICE Lit when the unit has detected a missing Service Ground. The TS-70 will not close the contactor until a proper Service Ground has been connected.

- The two phases (Line 1 & Line 2) are terminated on the input side of the contactor itself, as shown in Figure 7. The Service Ground is terminated on the Ground Terminal at the bottom of the enclosure.
- Be careful not to damage the PC Board when removing the power-entry knockout, attaching the conduit, or when wiring the service conductors to the contactor.

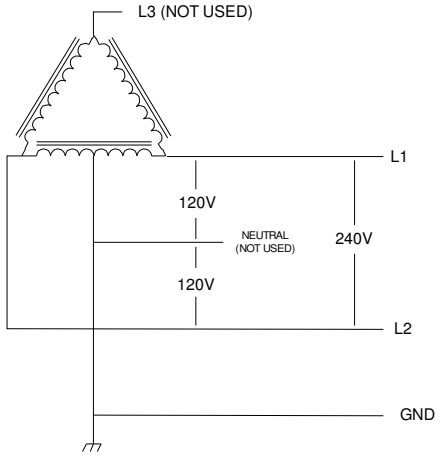
Testing After Installation

- Apply utility power, and observe that only the Green READY light is lit.
- The Charge Test buttons on the PC board simulate connection to a vehicle. Push the two Charge Test buttons at the same time. The contactor should close, and the large Amber Charge LED should light.
- If a vehicle is available, connect the TS-70 to the vehicle and verify that the contactor closes and the Amber Charging LED comes on.

Installation is complete.

Note: With a wye-connected secondary, any two of the legs can be used to provide 208V to the TS-70. For example, L1 & L2, or L1 & L3, or L2 & L3. Leave the unused leg open. Do not connect it to a Neutral bar, or to Ground. Be sure the center point is grounded to earth somewhere in the system.

Figure 4. 240V 3-Phase, Delta-Connected, with center-tap on one leg.



Caution With the delta connection, one leg *must* be center- tapped, and *only* the two phases on either side of the center tap can be used. The two phases must both measure 120V to neutral. The third line (L3) of the delta is 208V, with respect to neutral, and is sometimes referred to as a "stinger". ***Do not use this third line!*** Consult the transformer manufacturer's literature to be sure the single leg can supply the required power..

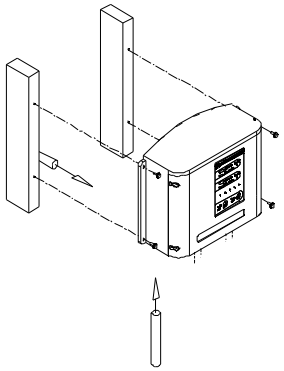
Caution A 3-phase delta-connected transformer secondary without a center-tap on one leg *is not usable with the TS-70*. No "neutral" point is available to be connected to ground for ground-fault protection, and the TS-70 will not allow the contactor to close if it does not sense the presence of a ground wire connected to a "neutral" point on the transformer secondary.

Mounting Procedures

1 Locate the wall mounting position of the EVSE:

- Position the bottom of the charge station 38 inches above the ground.
- The mounting holes are spaced 16" apart to accommodate wall studs.
- If you do not have solid structural framing on those centers, you must provide an adequate alternative mounting surface for the EVSE.

Figure 5. Wall mounting of TS-70.



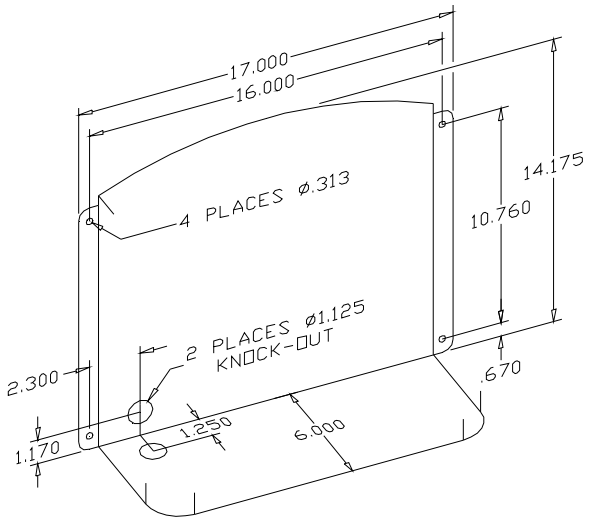
2 Attach the charge station to the wall studs using (4) ¼ x 2 ½" lag screws.

3 Use a multi-set or equivalent if mounting on a concrete wall.

4 Remove the applicable knock-out in the charge station, push the power leads through the hole, then connect the power conduit to the hole.

5 After mounting, continue the installation using the Wiring Instructions beginning on Page 10.

Figure 6. TS-70 Installation Template

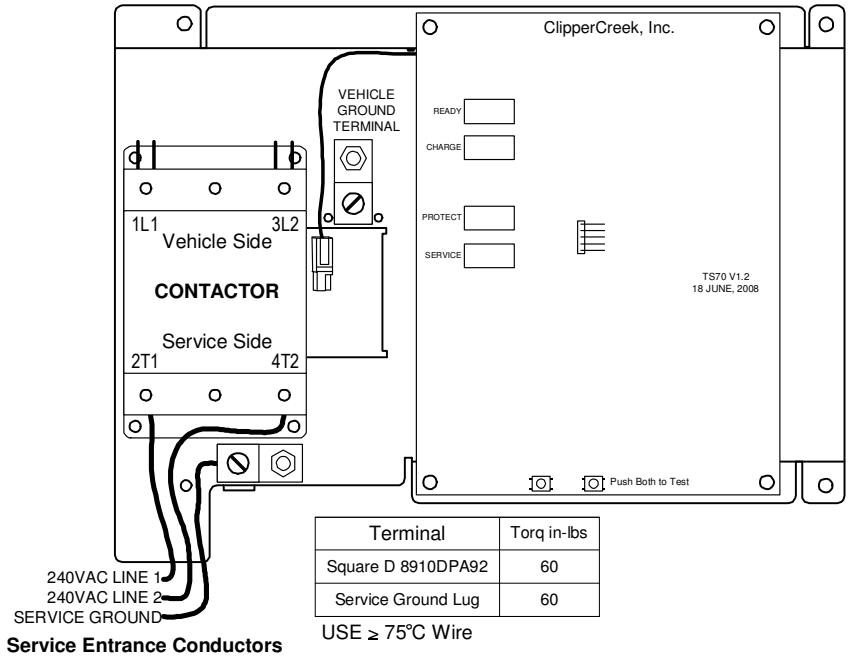


Wiring

To open the enclosure door, remove the two screws on the left-hand side, using a T15 Torx L Driver. Then unhook the latch located on the bottom of the unit over the connector holder.

Before connecting wires to the TS-70, please carefully read the section of this manual titled Service Connections, on page 6. If you are unsure of the type of power provided at the service panel, please consult with your local utility or call your Service Representative for assistance.

Figure 7. TS-70 Service Wiring



- The TS-70 requires a dedicated 208/240 VAC 60 Hz, single-phase circuit, with its own 90A circuit breaker.
- Do not use a GFCI breaker with the TS-70. The TS-70 contains a Personnel Protection circuit that is the equivalent and specifically designed for use with electric vehicles.
- Only 3 wires are needed to wire the TS-70 (Line 1, Line 2, and Service Ground), as shown in Fig. 7. Wire the unit from the breaker panel using wire sized according to local electrical codes. The circuit breaker should be rated at 90A.