



TS Series



Introducing the TS Series Inverter

The Model TS Series microprocessor-controlled modified sinewave inverter converts DC current into AC current. Rated at 400 to 800 watts continuous. Features include:

- Power-saving Search mode
- Easy installation
- Battery voltage indicator
- 15-amp AC pass-thru circuit
- User selectable low battery cutoff (LBCO)
- Automatic transfer to inverter mode when AC supply is interrupted (with SB option).
- User selectable transfer sensitivity (with SB Option)
- Optional dual 15-amp grounded AC outlet
- Optional plug-in three-stage battery charger
- Optional remote control

PRODUCT MATERIALS PACKAGE

THANK YOU FOR CHOOSING TRACE ENGINEERING PRODUCTS TO MEET YOUR ALTERNATIVE-ENERGY POWER NEEDS. WE MAKE EVERY EFFORT TO ENSURE THAT YOUR INVERTER/CHARGER IS PROPERLY PACKAGED FOR SHIPPING AND INCLUDES ALL THE MATERIALS REQUESTED. EVERY TRACE INVERTER/CHARGER IS PACKAGED WITH THE FOLLOWING MATERIALS:

- OWNER'S MANUAL;
- TRACE BUMPER STICKER;

IF ANY OF THE ABOVE LISTED MATERIALS ARE MISSING FROM YOUR PACKAGE, OR IF IT IS UNSATISFACTORY IN ANY MANNER, PLEASE CALL CUSTOMER SERVICE AT 360-435-8826 OR FAX THIS PAGE WITH YOUR COMMENTS TO 360-435-2229.

MODEL NUMBER: _____

SERIAL NUMBER: _____

COMMENTS: _____

CHECK OUT OUR WEB SITE AT WWW.TRACEENGINEERING.COM FOR MORE INFORMATION AND ANSWERS TO YOUR FAQ'S.

THE UNIT ASSEMBLED ON THIS SHEET IS THIS MODEL NUMBER ONLY					MODEL NUMBER EXAMPLE: TS512SB/ D B3 F L				

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS!

This booklet contains important instructions for Model TS Series that should be followed during installation and maintenance of the unit.

General Precautions

Before using this device, read all instructions and cautionary markings on (a) the device, (b) the batteries and (C) all appropriate sections of this instruction booklet. Refer to the Battery Council International for installation and servicing instructions for batteries.

CAUTION - To reduce risk of injury, charge only deep-cycle lead acid, lead antimony, lead calcium, gel cell, or absorbed-mat type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.

Do not expose the device to rain, snow or liquids of any type. This device is designed for indoor mounting only. Protect the device from splashing when used in vehicle applications. Do not mount this device in unventilated enclosures or in an engine compartment.

Do not disassemble this device: take it to a qualified Trace Service Center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire. Before using this device, read all instructions and cautionary markings in this booklet and on the equipment.

To reduce risk of electric shock, disconnect all wiring before attempting any maintenance or cleaning. Turning off the device may not reduce this risk. As long as AC input power is present, the charger section will be operable (if installed) regardless of the on/off switch position. Solar modules produce power when exposed to light - disable or disconnect before servicing any connected equipment.



WARNING - WORKING IN VICINITY OF A LEAD ACID BATTERY IS DANGEROUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL OPERATION.

Provide ventilation to the outdoors from the battery compartment. Design the battery enclosure to prevent accumulation of "pockets" of hydrogen gas at the top of the compartment. Vent the battery compartment from the highest point.

No terminals or lugs are required for hook-up of the AC wiring. AC wiring must be no less than 14 AWG (2.082 mm) copper wire and rated for 75C or higher. Battery cables must be rated for 75C or higher and must be no less than #6 AWG.

Torque all AC wiring connections to 16 inch-pounds (1.8 N-m). Torque all DC cable connections to 13 foot-pounds (157 inch-pounds) (17 N-m).

Special Notices

Tools required to make AC wiring connections: Wire strippers, Phillips screw driver #2, slotted screw driver 1/4" (6MM) blade, and a torque wrench.

This inverter is for use with a nominal battery-supply voltage of either 12-volt DC or 24-volt DC. See unit label for appropriate voltage required.

For battery installation and maintenance: read the battery manufacturer's installation and maintenance instructions prior to operating. Do not mount on or near flammable materials (plywood, chemicals, gasoline, etc.)

No AC or DC disconnects are provided as an integral part of this device. Both AC and DC disconnects must be provided as part of the system installation, if required.

No over-current protection for the battery supply is provided as an integral part of this device. Over-current protection of the battery cables must be provided as part of the system installation.

No over-current protection for the AC output wiring is provided as an integral part of this device. Over-current protection of the AC output wiring must be provided as part of the system installation.

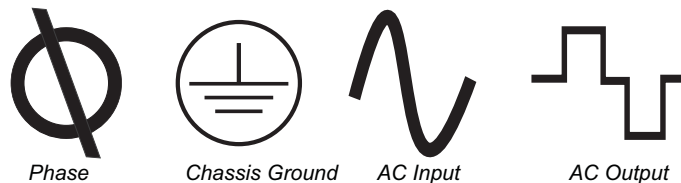
Caution: To reduce the risk of fire, use only input circuits provided with 20-ampere branch circuit protection in accordance with the National Electrical Code, ANSI/NFPA70.

DC GROUNDING INSTRUCTIONS - This device must be connected to a grounded, permanent wiring system. For most installations, the negative battery conductor must be bonded to the grounding system at one (and only one) point in the system. All US installations must comply with national and local codes and ordinances.

AC GROUNDING INSTRUCTIONS The AC system in mobile installations must have the neutral isolated from the grounding throughout the load distribution circuits.

Symbols

Symbols used in this booklet and on the device itself are shown below:

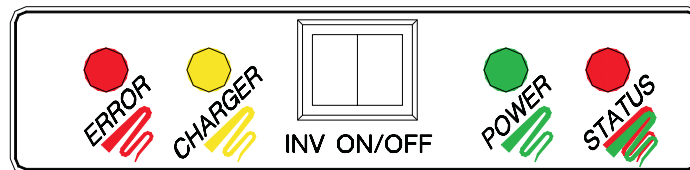


Controls and Indicators

The TS Series front panel features a power switch, four LEDs, and a fan on some models. The back panel configuration varies depending upon options.

Front Panel Controls

The TS Series front panel controls and indicators include a momentary push-button Power switch, a red error status indicator, a yellow charger status indicator, a green power light, and a white battery status indicator.



Inv On/Off Switch Operation

The momentary push-button switch on the front panel controls the operating mode of the inverter:

Search: Push the Inv On/Off switch once to enable Search mode. The power lamp will flash slowly in this mode. When in Search mode, the inverter emits a pulse testing the output circuits for loads. If a load greater than eight watts is present on the output circuit, the inverter turns On and provides AC power to the circuit for as long as the load is present, automatically switching back to Search mode when the load is no longer present.

On: When in Search mode, push the Inv On/Off switch once to turn the inverter to On mode. The inverter will produce AC power from the batteries until the low battery cut-off voltage is reached, or until the power switch is pressed once again.

When equipped with the optional battery charger, the device will remain in On mode until approximately 20 seconds after AC power is applied, when it will stop inverting, pass through the current, and begin charging.

Off: When in On mode, press the On/Off switch once to turn the inverter Off. The inverter draws very little power when in Off mode.

LED Indicators

The front panel features four LEDs which operate in the following manner:

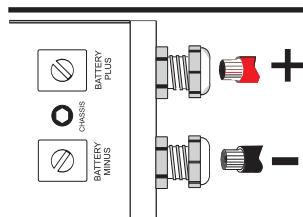
- ☐ Error : **Slow Flash: (One per second)** - Low battery error; indicates battery voltage is below low battery cutoff (LBCO)..
 Fast Flash: (5/sec) - High battery error; indicates battery voltage has exceeded 15.1 volts for about 25 seconds.
 Steady Red - Overload error; lights steadily when load exceeds rated capacity.
- ☐ Charger: **Slow Flash: (1/sec)** - AC is present but inverter has not transferred to charge mode.
 Fast Flash: (10/sec) - charger is charging in bulk/absorption mode.
 Steady Yellow - charger is charging in float mode.
- ☐ Power: **Slow Flash: (1/sec)** - inverter is in Search mode.
 Steady Green - AC is present on output.
 Flickering: inverter is charging.
 Off - inverter is off.
- ☐ Status: **Steady Green** - battery voltage exceeds 12.8 (25.6 for 24-volt)
 Fast Green Flash: (10/sec) - 12.5 to 12.7 volts (25.0 to 25.5)
 Slow Green Flash: (1/sec) - 12.3 to 12.4 volts (24.6 to 24.9)
 Slow Red Flash: (1/sec) - 12.0 to 12.2 volts (24.0 to 24.5)
 Fast Red Flash: (10/sec) - 11.8 to 11.9 volts (23.6 to 23.9)
 Steady Red - less than 11.8 volts (23.6 volts for 24-volt system)

Installation

Before beginning the installation, disconnect any power supply that you will be connecting to this device. This section describes mounting, installation, and cabling,

Mounting

Mount this device on a shelf or table in a clean, dry, well-ventilated location close to the DC supply. DO NOT locate this device in the same enclosure with batteries. Liquid lead-acid batteries may produce explosive gases and must be well ventilated. Sealed batteries may be located in the same enclosure. Allow adequate clearance around this device for proper ventilation.



DC Cabling

Use #6 AWG battery cables. Cables are available in 3, 5, and 10 foot lengths (BC3, BC5, BC10). Strip the insulation about ½" (12 mm) from the end of each wire. Using a Phillips screwdriver, remove the six screws from the top and side of the inverter and remove the cover. Loosen the uppermost strain relief by rotating the cap counter-clockwise, and insert the stripped end of the positive (+) battery cable through the strain relief and into

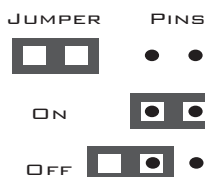
the cable lug marked "Battery Plus" on the PCB. Using a straight-blade screwdriver, tighten the screw in the lug to 12 foot-pounds, then tighten the strain relief. Repeat for the Battery Minus (-) cable. Replace the cover and reinstall the cover screws.

AC Cabling

On AC outlet equipped models, just plug-in the load or appliance to the pre-wired outlet on the back panel of the inverter. On units equipped with a factory-installed battery charger, wire the AC input circuit to the charger board as shown in the *Options* section of this booklet (some configurations may include a pre-wired AC line cord).

User Configuration Options

The standard TS series inverter requires no user configuration. When you have the standby battery charger option or the PV controller option, you can configure the TS Series for your specific system requirements. Configuration options include battery discharge voltage (LBCO), AC voltage transfer sensitivity, and battery type. To change configurations, disconnect any AC or DC power supply and loads from the unit and remove the cover from the chassis. Remove or install the jumpers from the configuration pins as shown in the illustration at right. If the unit is equipped with the SB charger option or the PV option, it may be necessary to remove the option board to gain access to the configuration jumpers. See the illustration on Page 9 to locate the configuration pins on the main printed circuit board (PCB)



A jumper is a small, rectangular piece of plastic with two square holes in it that fit over two pins as shown in the illustration at left. A jumper contains an internal conductor that joins the two pins, completing a circuit. When the jumper is removed, the circuit is interrupted. Jumpers are often used for changing configuration parameters. When a jumper is not connecting two pins, it can be stored by slipping it over just one of the pins instead of both. This will have no effect upon the configuration, but will keep the jumper handy for future use.

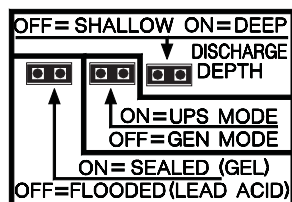
Discharge Depth

You can set the inverter to stop inverting when the battery to which it is connected has been discharged to 11.7 volts for 5 minutes (shallow discharge) or to 10.6 volts for one minute (deep discharge). The factory setting is Deep discharge. Shallow discharge means less battery stress and more charge/ cycles. Deep discharge allows the batteries to be discharged almost completely. This usually results in somewhat shorter battery life, but fewer charge/discharge cycles. To select Shallow Discharge, remove the jumper from the configuration pins. For Deep Discharge, the two pins must be connected by the jumper.

Transfer Sensitivity (SB Option Only)

The TS inverter can be configured to begin inverting whenever grid voltage falls to 95 volts RMS (UPS mode) or to delay transfer until line voltage falls to 80 volts RMS (Gen mode). The factory default, UPS mode, is relatively intolerant of line voltage fluctuations to prevent

computer brownouts, and is preferred when operating devices that are sensitive to voltage fluctuations. GEN mode is preferred when line voltage is provided by a generator, some of which provide AC power with significant fluctuations in RMS voltage. To select UPS mode, connect the two pins with the jumper provided. For Gen mode, remove the jumper from the pins. Store the jumper by leaving it on one pin only. Transfer time from grid to inverter is about 8 to 12 milliseconds.



DEEP > 10.6 V_{DC}

SHALLOW > 11.7 V_{DC}

UPS = 95V_{AC} RMS

GEN = 80V_{AC} RMS

SEALED	FLOODED	
14.3	14.7	Bulk Volts
60 min	60 min	Absorption Time
13.6	13.4	Float Volts

Battery Type (SB Option Only)

The TS Series can charge either liquid lead-acid (flooded) batteries or sealed, gel or absorbed glass batteries. The difference is in the charge voltages. The unit comes from the factory pre-configured for sealed batteries. To change to flooded batteries, remove the jumper from the pin pair labeled Sealed/Flooded.

Selecting the Best Battery

There are many types and sizes of batteries available, including starting, deep-cycle, sealed gel, and absorbed glass mat. Which battery is best for your installation depends upon your unique circumstances. In order to help you choose, a discussion of these types of batteries is found in this section.

Starting Batteries

Starting batteries are designed for high cranking power, not deep cycling. Don't use them.

Deep Cycle Batteries

This type of battery is best suited for use with inverters because they tolerate a greater depth-of-discharge before being recharged. The most common type is the non-sealed, liquid-electrolyte battery, which have removable cell caps for monitoring the electrolyte level. When a cell is low, add only distilled water. Check the electrolyte level at least monthly. Top-up after recharging.

A popular and inexpensive deep-cycle battery is the six-volt golf cart battery rated at 220 amp-hours. These can be cycled repeatedly to 80% of their capacity without damage. The TS512 is a 12-volt system, therefore you must connect at least two of these batteries in series in order to produce 12 volts. The TS524 is a 24-volt system and required four of these batteries.

Some systems use the L16 type of battery: six-volt batteries rated at 350 amp-hours available from a number of manufacturers. At 17 inches in height and up to 130 pounds each, they may be difficult to place in mobile or marine installations.

Type 8D batteries are available in either starting or deep-cycle construction. Most common are the starting version used to start very large truck engines. Make sure you purchase the deep-cycle version. These deep-cycle versions are 12-volts and are rated at 200 amp hours or so. Type 4D batteries are very similar in construction, but about one-third smaller.

Sealed Gel Cell

Sealed gel cell batteries do not use battery caps because the electrolyte is in the form of a gel. This allows the batteries to be mounted in any position without spilling. Other advantages are: no maintenance, long life (800 cycles claimed), and low self-discharge. The disadvantage is high initial cost and the possibility of damage from overcharging. Don't confuse sealed batteries with maintenance-free batteries - the latter are typically standard liquid electrolyte batteries with no caps for adding water; when the electrolyte gets low you replace the battery. For best results, use the Battery Temperature Sensor (BTS) option with sealed batteries.

Monthly Maintenance

Check the level of the electrolyte in each battery at least once a month. It must be above the top of the plates, but not completely full. Most batteries have a split plastic cup under the caps, which the electrolyte should just touch when full. Don't overfill the batteries, or the electrolyte will spill out of the batteries when recharging. Refill batteries with distilled water only - "spring" water and regular tap water may have high levels of minerals that can poison the battery chemistry and reduce battery life.

Check the battery cable connectors for tightness and corrosion. To remove corrosion, disconnect the cables and carefully rinse with a mild solution of baking soda and water. DO NOT ALLOW THE SOLUTION TO ENTER THE BATTERY. Rinse the top of the battery with clean water when finished. Remove stubborn corrosion with a wire brush. Any automotive parts store will have a wire brush tool specifically designed for cleaning cable lugs and battery terminals.

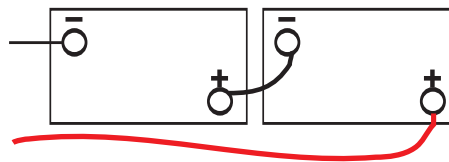
To prevent corrosion from forming on the battery terminals and cable lugs, coat them (only after installing the cables) with liquid neoprene or anti-corrosion grease available from any quality marine, automotive or battery equipment supplier. Do not apply any material between the terminal and the cable lugs - the connection must be metal-to-metal. Apply the protective coating only after the bolts are tight.

Inter-Battery Cabling

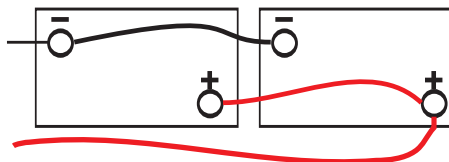
Batteries may be connected in series, in parallel, or both depending upon your purpose.

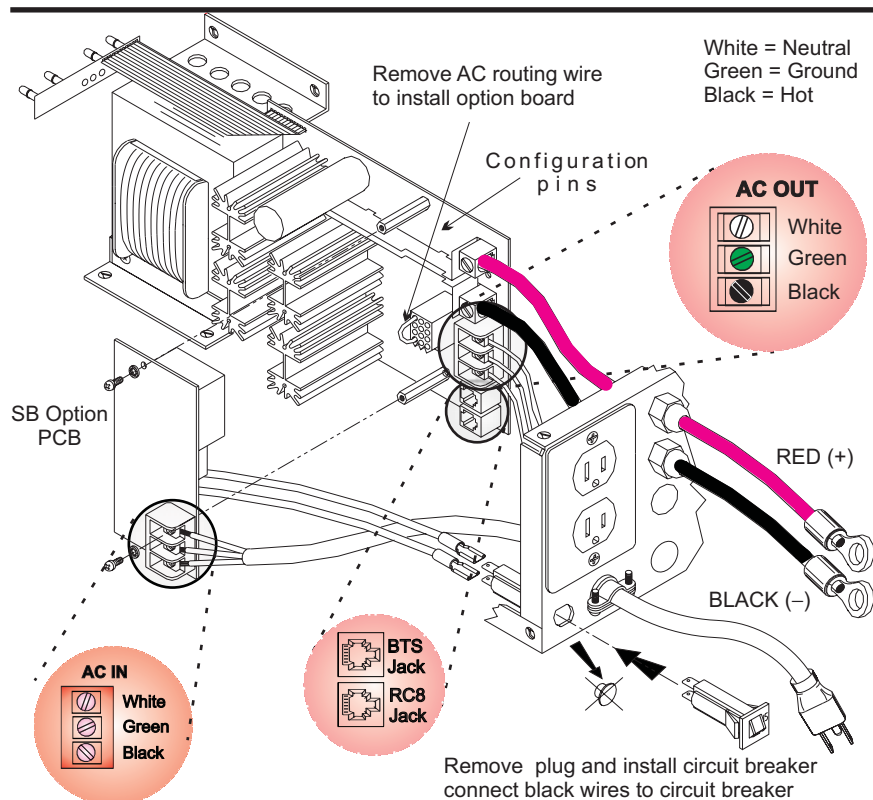
To increase voltage, connect two or more batteries in series as shown in the diagram below. The voltage of the combined batteries will be the sum of the voltage of all the batteries. The amp-hour capacity will remain unchanged. To increase amp-hour capacity, connect two or more batteries in parallel as shown in diagram B. The amp-hour capacity of the combined batteries will be the sum of each individual battery, but the voltage will remain unchanged.

A. Series Cabling:
 $6\text{-volt} + 6\text{-volt} = 12\text{ volt.}$



B. Parallel Cabling:
 $220\text{ ah} + 220\text{ ah} = 440\text{ ah}$





Options

Field-installed options for the TS Series include either a three-stage standby battery charger (SB option), a battery temperature sensor (BTS option), and a remote control (RC8 option).

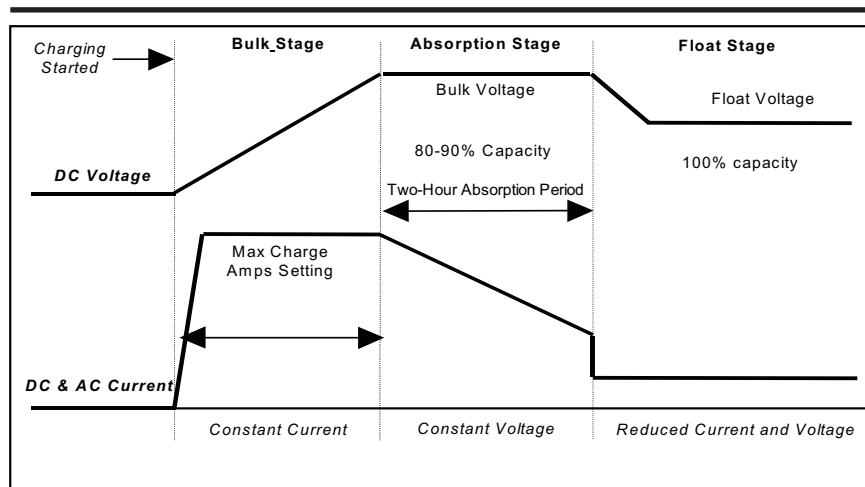
Standby Battery Charger

The Stand-By (SB) charger option features a three-stage automatic battery charger with AC pass-through relay mounted on a PCB that can be field installed, includes an AC power supply cord and circuit breaker, and enables transfer sensitivity, battery selection, and depth of discharge.

Battery voltage is varied during the three stage battery charging process, as follows:

BULK -During this initial stage of charging, the Charge LED flashes about once each second and the inverter charges at a constant current. This causes the battery voltage to rise over time. When battery voltage reaches the bulk voltage setting (see *User Configuration Options* for voltage settings), the charger begins the absorption stage of charging.

ABSORPTION -During this phase, the charge current gradually reduces while the battery voltage is held constant for two hours at the bulk voltage. During the ABSORPTION stage, the Charge LED flashes rapidly.



FLOAT - During this stage the voltage of the battery is held at the FLOAT voltage setting. Full current from the PV array can be provided to the loads connected to the battery during the float stage. When the battery voltage has reached the FLOAT stage, the status LED will be steady green.

When the battery voltage drops below the FLOAT setting for a cumulative period of one hour, a new BULK cycle will be triggered. This typically occurs each night. If the battery is full at the start of the day, it will receive an ABSORPTION charge for one hour and then be held at the FLOAT setting for the remaining period of the day. Should the battery voltage drop below the FLOAT setting for a cumulative period of one hour, another BULK and ABSORPTION cycle will be initiated.

This three-stage charging process results in faster charging compared to on-off relay type or constant voltage solid-state regulators. The final FLOAT voltage setting reduces battery gassing, minimizes watering requirements and ensures the complete battery recharging.



Warning: Do not connect the AC power cord to the AC out terminal. You may damage the unit.

Inverter to Charger Transition

On inverter models equipped with the three-stage internal standby battery charger, the charger and an automatic transfer relay allows operation as either a battery charger or an inverter, (but not both at the same time). An external source of AC power (e.g. shore power, generator, and/or utility grid) must be supplied to the inverter AC input in order to allow it to operate as a battery charger. As long as AC power is supplied to the charger, it operates regardless of the position of the On/Of switch. When operation as a charger, the inverter's AC output is provided by the external source.

The inverter automatically becomes a battery charger after a 10-second delay whenever AC power is supplied to it. This delay is built-in to provide time for a generator to spin-up to a stable voltage and avoid relay chattering.

The inverter's AC input connects internally to the inverter's AC output while in the battery charger mode. A 15-amp pass-through relay accomplishes this switching, protected by a 15-amp circuit breaker.

Battery Temperature Sensor

An optional battery temperature sensor (BTS) can be field-installed at anytime. Remove the lid of the chassis as described in the Optional Standby Battery Charger section. At the bottom right-hand edge of the TS board are two RJ11 plug jacks. The top-most jack is labeled 'BTS.' Remove one of the 7/8 -inch knockout plugs in the chassis endplate and install the BTS through this opening and plug it into this jack. Sandwich the BTS sensor between any two of the batteries in your system. The BTS will enable the SB charger to 'fine tune' the charging voltage based on temperature and lengthen battery life



RC8 Remote On/Off Switch

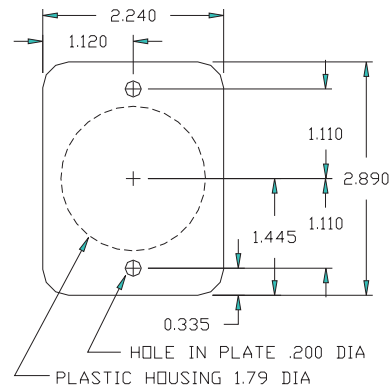
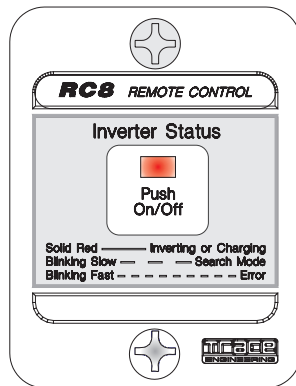
The optional RC8 remote control unit duplicates the Power On/Off Switch on the inverter/charger and is coupled to the inverter. It connects directly to the six-conductor RJ15 phone jack labeled RC8 on the bottom right of the inverter PCB (see illustration on Page 9). Use the Trace remote cable provided with the RC8 because it is tin-plated stranded cable with gold-plated connectors.

The front panel of the RC8 also shows the status of different modes of the inverter. The red LED on the front directly mimics the green LED on the inverter/charger. The following indications are shown by the RC8:

- Steady Red: unit is in inverter or charger(if installed) mode
- Slow blinking Red (1-3 flashes): unit is in search mode
- Rapidly blinking Red : indicates overcurrent condition. Unit will shut Off after 8-12 seconds of an overcurrent condition.

RC8 Remote Installation

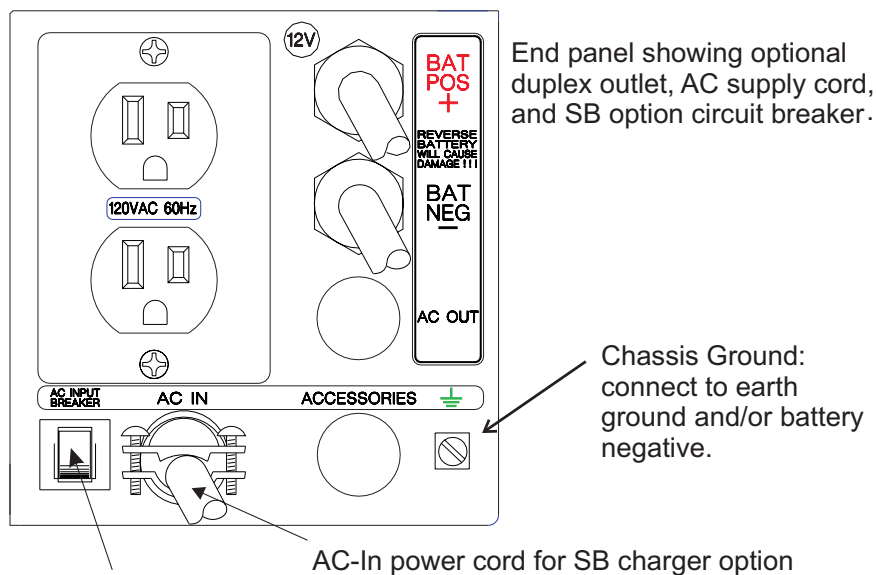
Cut a 1-7/8" diameter hole. At least 1½" of clearance is required behind the hole. Next drill the two holes needed to screw the installation to the wall. After routing the Trace remote cable, plug it into the six-conductor, RJ15 phone jack on the TS main PCB.



Rear Panel Configuration

The TS series rear panel configuration is determined by the model and options selected. Some models will have one or more of the features listed below:

- ☐ Duplex Outlet Option (D): a 120-volt, 15-amp outlet is provided on some models.
- ☐ Duplex Outlet Option (I): 230-volt, 15-amp for export models outlet is provided on some models.
- ☐ GFCI Outlet Option (P): Ground Fault Circuit Interrupt outlet is required on some U.S. models.
- ☐ Outlet plate: blank plate provided when no outlet is installed, AC Out cable must be hardwired to the TS PCB as shown in these instructions.
- ☐ 15-amp input circuit breaker provided as part of the standby battery charger option.
- ☐ AC-In Power Cord Option (L): 14/3 120-volt AC stranded-copper power cable with molded standard U.S. plug provided only with standby battery charger option.
- ☐ Battery Cable Option (B#): #6 AWG stranded copper cable, insulated with black (negative) or red (positive) vinyl for polarity identification. Available in three, five or 10 foot lengths. Specify BC3, BC5, or BC10
- ☐ Zinc strain relief: provided only with standby charger option.



Circuit Breaker (provided with
SB option) Press to reset

SPECIFICATIONS

(BASED ON 25° CENTIGRADE)

MODEL	412E	424E	512	524	712E	724E	812	824
POWER V/A	400	400	500	500	700	700	800	800
SURGE CURRENT AMPS	N/A	N/A	16@1MS	N/A	N/A	N/A	N/A	N/A
PEAK EFFICIENCY	92%	95%	92%	95%	92%	94%	90%	92%
DC INPUT CURRENT IN SEARCH MODE	~1 WATT FOR ALL MODELS							
AT IDLE @12.6V/25.2V	.50 AMPS	.25A	.50A	.25A	.50A	.25A	.50A	.25A
AT RATED POWER	34 AMPS	17A	43A	21A	60A	30A	70A	35A
NOMINAL INPUT DC VOLTS	12	24	12	24	12	24	12	24
INPUT VOLTAGE RANGE VDC	10-15	20-30	10-15	20-30	10-15	20-30	10-15	20-30
OUTPUT VOLTAGE VAC)	230	230	120	120	230	230	120	120
VOLTAGE REGULATION	±6%	±6%	±6%	±6%	±6%	±6%	±6%	±6%
FREQUENCY REGULATION	±0.04% ALL MODELS							
LOAD SENSE	~8 WATTS ALL MODELS							
AUTO LOW BATTERY CUTOFF	101.6 - 11.7 FOR 12-VOLT MODELS /21.2 - 23.4 FOR 24-VOLT MODELS							
TRANSFER RELAY	15 AMPS AC FOR ALL MODELS							
INTERNAL FAN COOLING	OPTION	OPTION	OPTION	OPTION	YES	YES	YES	YES
MAX CHARGE RATE AMPS DC	15	8	15	8	25	13	30	15
CHARGE PROFILE	3 STAGE: BULK, ABSORPTION, FLOAT							
DIMENSIONS	14" H X 5.5" W X 5.375" D (355.6MM X 139.7MM X 136.525 MM)							
SHIPPING WEIGHT	17 LBS (7.71 KG) → 23 LBS (10.4 KG) →							

TROUBLESHOOTING

<u>Symptoms</u>	<u>Problem</u>	<u>Remedy</u>
No AC power output No warning LED's	AC routing wire disconnected	reconnect wire See page 9
	Battery voltage at the inverter's terminals is too high or low	Check voltage, fuses or breakers, cable connections
No power output Search LED flashing slowly	Load too small for Search Mode circuit to detect	defeat search mode, turn unit on
Power output LED Flashing rapidly or erratically	Overload	Remove or reduce loads allow inverter to cool before restarting
Power output is low inverter turns loads on and off and on	Low battery	Check condition of batteries and recharge
	Loose or corroded battery - connections Loose AC output connections	Check and clean connections Check all AC output connections
Inverter shuts down after 20 seconds	Output of inverter wired back to its own input	Check for proper AC input and output wiring
Charger is inoperative	AC input voltage does not match inverter spec	Check AC input for proper voltage and frequency of your model, 120 VAC models need >90 VAC to operate. Refer to owner's manual for proper setting
	Charger voltage improperly set	
Low charge rate	Low <u>peak</u> AC input voltage (164 volts peak required for full charger output)	Use larger generator, speed up generator, check AC input wiring size cable too small or too long
	AC current output of generator too small to handle load	Reduce loads
Low surge power	Weak batteries, battery cables too small or too long	Refer to cable and battery recommendations in owner's manual
Error LED on steady	Overload	Let unit cool down, reduce loads
No power at SB charger terminals	Charger relay stuck	Have unit serviced

Warranty

Limited 2 Year Warranty

NOT FOR USE WITH LIFE SUPPORT EQUIPMENT

Trace Engineering Company warrants its power products against defects in materials and workmanship for a period of two (2) years from the date of purchase and extends this warranty to all purchasers or owners of the product during the warranty period. Trace does not warrant its products from any and all defects: (1) arising out of material or workmanship not provided by Trace Engineering, or (2) resulting from abnormal use of the product or use in violation of the instructions, or (3) in products repaired or serviced by other than Trace Engineering repair facilities, or (4) in components, parts, or products expressly warranted by another manufacturer. Trace Engineering agrees to supply all parts and labor or repair or replace defects covered by this warranty with parts or products of original or improved design, at its option, if the defective product is returned to any Trace Engineering authorized warranty repair facility or to the Trace Engineering factory in the original packaging, with all transportation costs and full insurance paid by the purchaser or owner.

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