

Owner's Manual

Version 1.1

RC5 Remote Control and Display for Models M1512 and M1524 Inverters

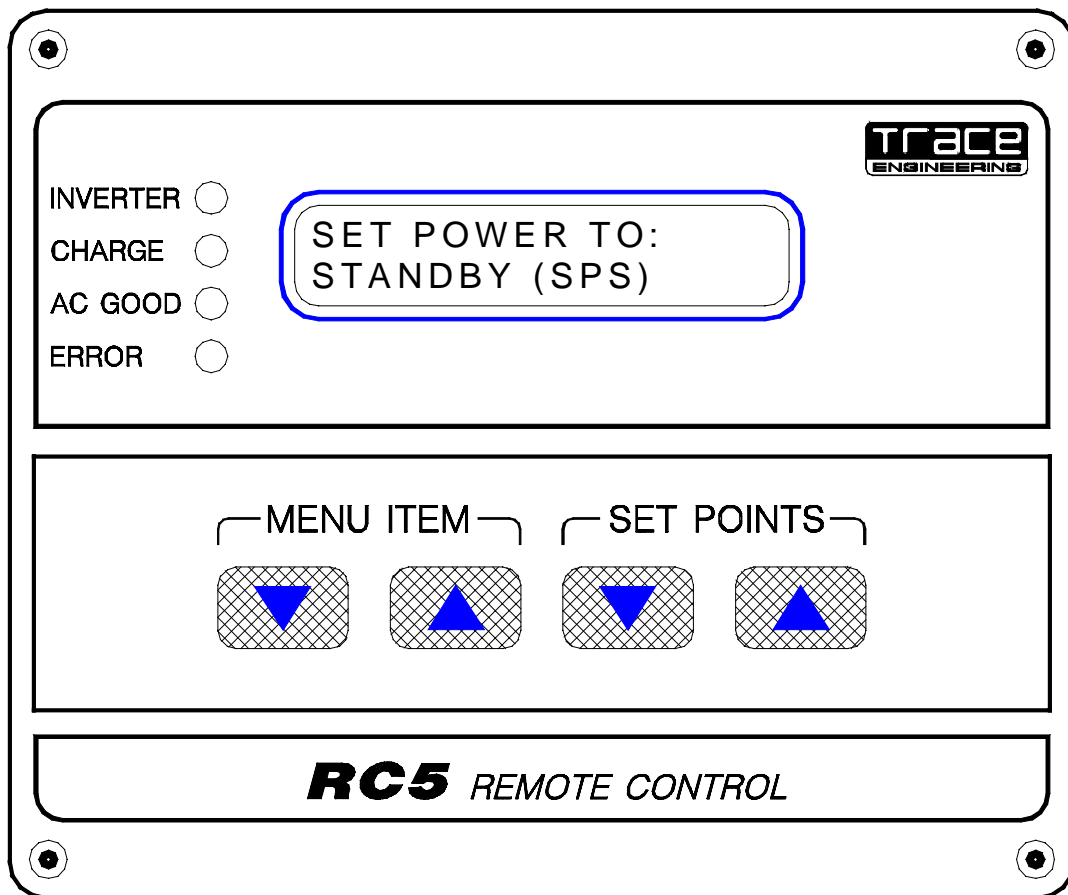


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Product Overview

The Model RC5 is a microprocessor based remote control and display for Trace Engineering's Model M1512 and M1524 power inverters. Designed for use in marine and RV applications, it provides complete remote control and display of the inverter's operating status and system conditions. Features include a 32 character alphanumeric LCD display and water resistant front panel with sealed membrane keys for use in marine environments.

The RC5 incorporates a two level menu system, separated into a **Status Menu** that provides the user with the operating information, and a **Setup Menu** for use during the installation and adjustment of the system. The remote control overrides the on/off power switch and ignores all the internal control settings, except the "Search Watts" (see page 10).

The **Status Menu** provides:

- Control of the inverter's operating mode (off, standby and charger only).
- Indication of the operating status (off, searching, inverting, charging, and error condition).
- Measurement of important system parameters (battery voltage, DC current, and AC input and output voltages).
- Indication of the battery's approximate state of charge by a "gas gauge" bar graph display.

The **Setup Menu** provides:

- Adjustment of the energy saving load sensing search mode.
- Control of the Low Battery Cut Out (LBCO) system to prevent battery over-discharge and damage.
- Adjustment of the battery capacity setting to improve accuracy of the LBCO, the battery bar graph display and the charger's return amps.
- Selection of the battery type (gel cell or liquid lead acid).
- Adjustment of the maximum charge rate for the battery charger.
- Adjustment of the AC dropout voltage for the AC transfer switch.
- Adjustment of the maximum shore power amperage available.
- Control of the display mode (last key, power saver or rolling).
- Adjustment of the LCD's contrast for different lighting conditions.

The RC5 will **only** operate with the M1512 and M1524 inverters that include the necessary internal software for communication. To check your inverter, open the door and examine the labels on the integrated circuits (IC's) on the circuit board. The large 40 pin IC #1904-1 should be marked Rev. 120 or higher. The small 16 pin IC #1916-1 should be marked 1.01 or higher. Contact your Trace dealer if an upgrade of the inverter's software is required. The RC5 will not operate without the correct software installed.

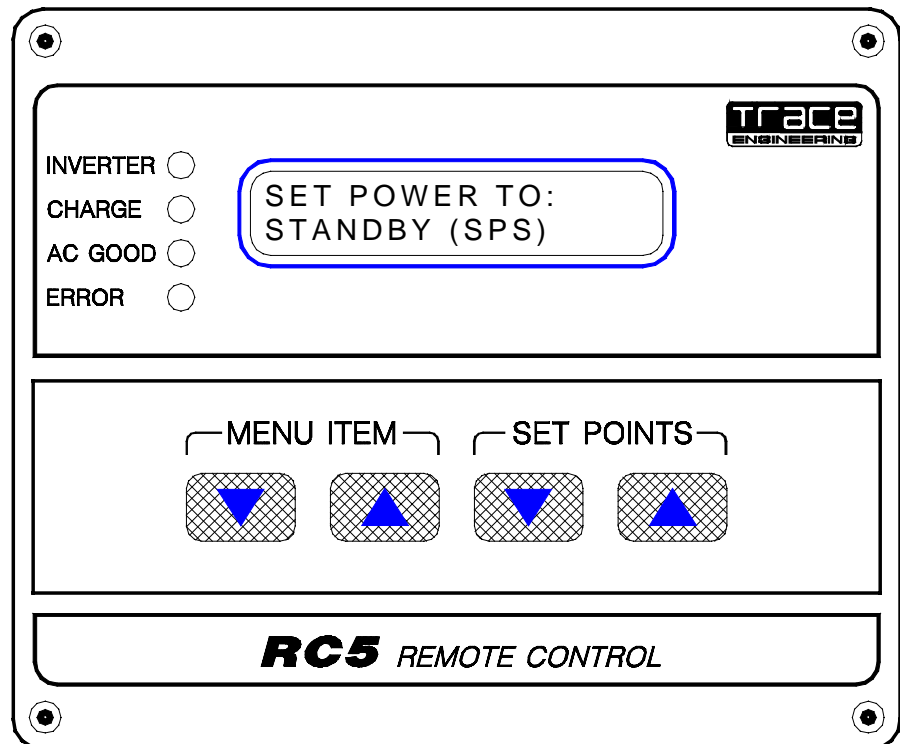
We at Trace Engineering sincerely thank you for choosing our products and hope that you will be completely satisfied with them.

Remote Control Operation

The RC5 should be connected with the inverter turned off. If the display shows "**recycle power to inverter**", turn the inverter off with the switch located on the inverter. This is only required after the RC5 has been disconnected from the inverter. If the display indicates this during normal operation, check the connectors and/or replace the cable

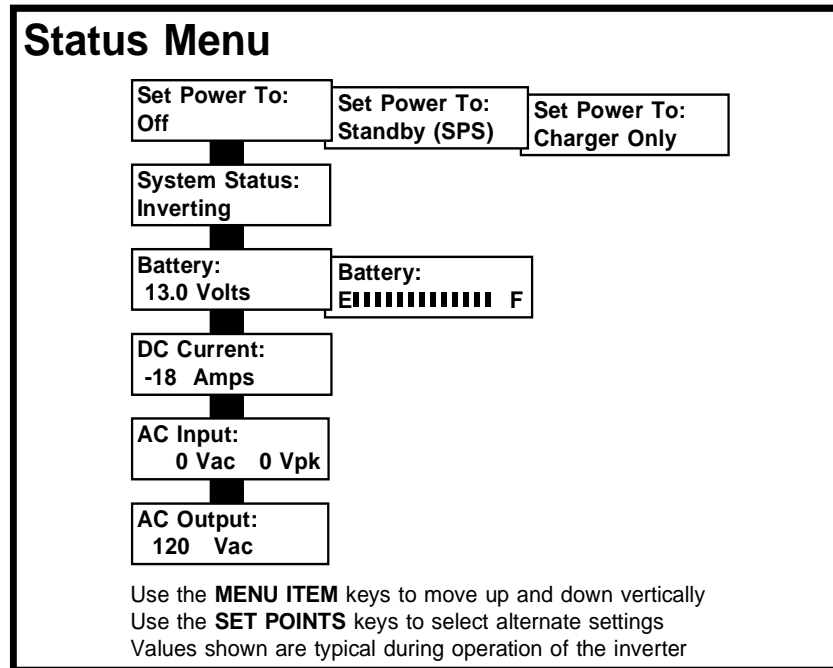
Self Test

When the system is first powered up the display will enter the STATUS MENU with the screen displaying a "**Set Power To: Off**" message. It is normal for the RC5 to momentarily flash its multicolored LED indicators when first turned on. This indicates that the remote display is properly connected and ready to operate.



Using the Status Menu

The Status Menu provides the user with the basic information and control needed to operate the system. Use the **MENU ITEM** keys to move up and down the menu. Use the **SET POINTS** keys to select the alternate settings.



Set Power To:

The factory default setting is to start with the inverter turned off. To turn the inverter on, press the down arrow **SET POINTS** key once to select **Standby (SPS)**. The inverter is now ready to operate AC loads. If operation of only the battery charger is desired, set the display to **Charger Only**. This mode is often used for systems which are left on charge and unattended for long periods of time, such as a boat docked at a marina.

System Status:

To display the operating status of the system, press the down arrow **MENU ITEM** key once. If you had set the inverter to the **Standby (SPS)** mode, it will display either **Inverting** or **Charging**, depending upon whether AC power is available to the battery charger's AC input.

When AC power is available and connected to the inverter's AC input, the inverter will enter its battery charging mode. The first stage of the recharging process is called **Bulk Charging**. In this mode the charger will provide the full charging current to the battery. Once the battery reaches a fully charged condition, the battery charger will switch to the next stage, called **Absorption Charging**. In this mode the charger will maintain the battery at a constant voltage level for a limited period of time to assure that the battery is fully charged. If power is still available to the inverter, the battery charger will next switch to **Float Charging** the battery to keep the battery full without overcharging it. The inverter will remain in the **Float** mode until the power is removed from the battery charger's AC input. For more information on the operation of the battery charger, see the owner's manual.

If a problem occurs while the inverter is operating, the system status will display what has occurred and what action should be taken to correct the problem. There are four error conditions:

Hibat/Stop Chrg - The battery voltage has exceeded the operating range of the inverter. You should turn off your charging sources to allow the voltage level to drop. The inverter will automatically reset and begin operation when the battery reaches a safe voltage level.

Lobat/Start Chrg - The inverter has shut off to prevent damage to the battery. To reset the inverter, either start your generator or connect to shore power to start charging the battery.

Otemp/Less Load - The inverter's transformer or power components has exceeded a safe operating temperature level. You can reduce the load on the inverter to prevent this from occurring. When the inverter has cooled, the inverter will automatically reset and begin operation. If this occurs often, you should make sure the inverter is in a cool location and that it has adequate air flow available for cooling.

Oload/Less Load - The inverter has reached its maximum design power level and turned off. Reduce the amount of loads and restart the inverter.

Battery:

Information on the battery is provided by both the DC input voltage and a "gas gauge" bar graph of the battery's condition. To change to the bar graph display, press the down arrow **SET POINTS** key once. The display will remain in the gas gauge mode when the menu is cycled through again. To return to the battery voltage display, press the down arrow **SET POINTS** key again.

The gas gauge display compensates the battery voltage measurement for the load and charging current flow. This provides a more accurate indication of the battery's condition than available from the voltage measurement alone.

DC Current:

The DC input current is provided to indicate the inverter's load on the battery and the charger's output. The DC current multiplied by the system voltage will give an estimation's of the load's wattage, including the inverter's efficiency losses (Volts x Amps = Watts).

The value displayed will be negative while the inverter is operating, indicating that power is flowing out of the batteries. When the battery charger is operating, the current flow will be displayed as a positive value. This indicates that the power is flowing into the battery.

AC Input:

The AC input voltage is provided to enable the user to check the AC power source for battery charging. Both the **average** and **peak voltage** is provided. The average voltage should be near 120 Vac (or 230 for "I" and "E" export model inverters) and is a good indication of the power source's quality. The peak voltage should be over 160 Vac for the proper operation of the battery charger.

Since the inverter passes through the power from the AC input to the AC output while battery charging, the AC loads will actually be operating from the generator or shore power.

AC Output:

The inverter's output voltage regulation is indicated by the AC output voltage. If the inverter is heavily loaded, the output voltage may drop. The display will indicate that the inverter's output is not within the regulation specification by displaying **<120 Vac**.

When the inverter is in search mode and not operating any loads, the display will show **< 40 Vac**.

Alarm Buzzer:

The RC5 includes an internal buzzer which will sound for up to five minutes when an error condition has occurred. It will automatically reset after the error condition is corrected.

Using the Setup Menu

The **Setup Menu** is accessed by holding down the two **MENU ITEM** keys at the same time for approximately five seconds. To return to the **Status Menu**, hold both of the **MENU ITEM** keys for approximately one second.

To get more information on any of the following control settings, see the inverter's owner manual. It includes detailed explanations of each control and examples of appropriate settings for different applications.

The RC5 will override all of the inverter's internal control settings, except for the **search watts**. If the RC5 is disconnected, the inverter will use the internal control settings after a one minute delay. If the inverter is disconnected from the battery, or if the communication cable is disconnected, the RC5's settings will return to the factory default values.

You may want to note the settings chosen for your system on the "menu map" included in the back of this manual.

Search Sense:

This setting controls the sensitivity of the inverter's load sensing circuitry. **The circuit board mounted control inside the inverter must be set at 50 watts (or at 12 o'clock) for proper operation of the RC5 to occur.** You should check the search sense setting when you connect the RC5, before you operate the system.

The factory default setting for the RC5 is to **defeat** the search mode. This means that the inverter will not reduce its power consumption when there are no loads connected. To adjust the setting, use the **SET POINTS** keys to change the value shown.

Auto LBCO:

The low battery cut out (LBCO) circuit provides over-discharge protection to the battery. It monitors both the battery voltage and the current being drawn by the inverter to more accurately estimate the battery's condition.

If the **Auto LBCO** control is set to **off**, the inverter will continue to operate until the battery is fully discharged. This may cause damage to the battery. The inverter will then shut off to protect itself. It will automatically be reset if AC power is provided to the battery charger's AC input.

You can de-activate the **Auto LBCO** control by pressing the down arrow **SET POINTS** key once. It can be re-activated by pressing the **SET POINTS** key again.

Bat Capacity:

The LBCO "load compensation" circuit, the "gas gauge" display and the battery charger's return amp setting require information on the battery bank size to accurately operate. The battery bank size is adjustable from 50 to 1000 amp-hours. Use the **SET POINTS** keys to select the closest setting to the size of your battery. Be sure that the battery's rating you are using is not the batteries "cold cranking amps" rating. For more information, see the inverter's owner manual section on batteries.

Battery Type:

The battery charger's settings are optimized for two types of batteries. The default battery type is **Gel Cell**. To select **Liquid Lead Acid**, press the down arrow **SET POINTS** key once.

Charge Rate:

You can adjust the battery charger's maximum output current level by adjusting the **Charge Rate %**. The M1512 has a maximum charge rate of 70 amps and the M1524 is 35 amps. Use the **SET POINTS** keys to adjust the charger's output to fine tune the battery charger's operation.

Vac Dropout:

The inverter constantly monitors the AC input's voltage level. If it drops to a low level, the inverter will disconnect the AC input, turn off the battery charger and power the loads from the battery. The voltage level is adjustable from 80 Vac to 105 Vac (160 Vac to 210 Vac for export models). Use the **SET POINTS** keys to select the best setting for your application. A lower setting will reduce transfers due to voltage fluctuations, but may result in a slightly longer transfer time when the shore power fails or is disconnected.

Shore Pwr Amps:

The shore power amperage setting is adjustable. The inverter monitors the AC power being drawn by both the battery charger and the AC loads connected to the inverter. If the level approaches the circuit breaker's rating, the battery charger will "back off" to prevent tripping and loss of power. For this to operate properly, all of the AC loads should be connected to the inverter's output. Any loads which operate off of shore power directly will not be included, which may result in nuisance tripping of the shore power circuit breaker. Use the **SET POINTS** keys to adjust the setting for your application.

This control can also be used to prevent overloading of backup generators if they are used to charge the battery, as well. Adjust the setting to match the generator's maximum continuous output. This is usually lower than the rating of the circuit breaker provided on the generator's output.

RC5 Setup:

The RC5 has three display modes for the **Status Menu** to suit the preferences of the system user:

Last Key - This is the default setting for the RC5. The display will remain with the same menu item as when you last left it.

Power Saver - In this mode, both the LCD display and the LED's will turn off after five minutes to reduce power consumption. When any key is pressed, the display will turn on with the same display as before (the first key stroke is ignored). If an error condition occurs, the display will be turned on until the problem is corrected.

Rolling Display - In this mode the display will begin to cycle through the Status Menu after no keys have been pressed for five minutes. Each display is shown for approximately three seconds. After a key is pressed, the display will be stationary for five minutes, and then resume the rolling display.

Use the **SET POINTS** keys to select the desired display mode.

LCD Contrast:

The display's contrast is adjustable to improve readability in different lighting conditions. Use the **SET POINTS** keys to set the contrast to the best level.

Installation

The RC5 is easy to install. The following is the recommended installation procedure:

1. Select a location for the RC5 to be mounted.
2. Use the provided template to mark the cut-out required.
3. Install the cable from the inverter to the RC5's location.
4. Protect the cable from physical damage by sharp edges, etc.
5. Route the cable away from potential sources of interference such as high powered antennas.
6. Connect the phone type cable to the RC5 before installing into cut-out.
7. Install the RC5 into the cut-out opening and seal with foam rubber or silicone sealant if required.
8. Turn off the inverter by the switch on the front of the cabinet.
9. Disconnect the inverter from the battery.
10. Open the cabinet's door to access the main circuit board.
11. Plug the cable into the jack labeled "J4" on the door mounted circuit board at the bottom. It is the left most jack of the 3 jacks provided.
12. Check the Search Watt setting - it must be set at 50 watts (at the 12 o'clock position). All other control settings are ignored when the RC5 is connected to the inverter.
13. Reconnect the battery and turn on the inverter.

The RC5 is now operational and ready to use. If you are installing the RC5 in an area which may be exposed to direct spray or rain, you should seal the back of the front panel to the mounting surface with either a soft foam rubber gasket or silicone sealant.

Inverter Control Settings

The RC5 overrides all of the inverter's internal control settings except the search watts control. **This must be set at 50 watts to allow the RC5 to adjust the search mode circuitry remotely. This setting is straight up or at the 12 o'clock position.** The other control settings are all ignored while the RC5 is connected. If the RC5 is disconnected, the inverter returns to the control of the internal settings.

Note: the default setting for the search mode when the RC5 is connected is to disable its operation. You must set the search sense to the appropriate wattage level for it to operate. If the inverter is disconnected from the battery or the RC5 is unplugged, you must reset the search sense setting and any other settings you require. You can record the settings used on the menu map provided at the end of this manual for future reference.

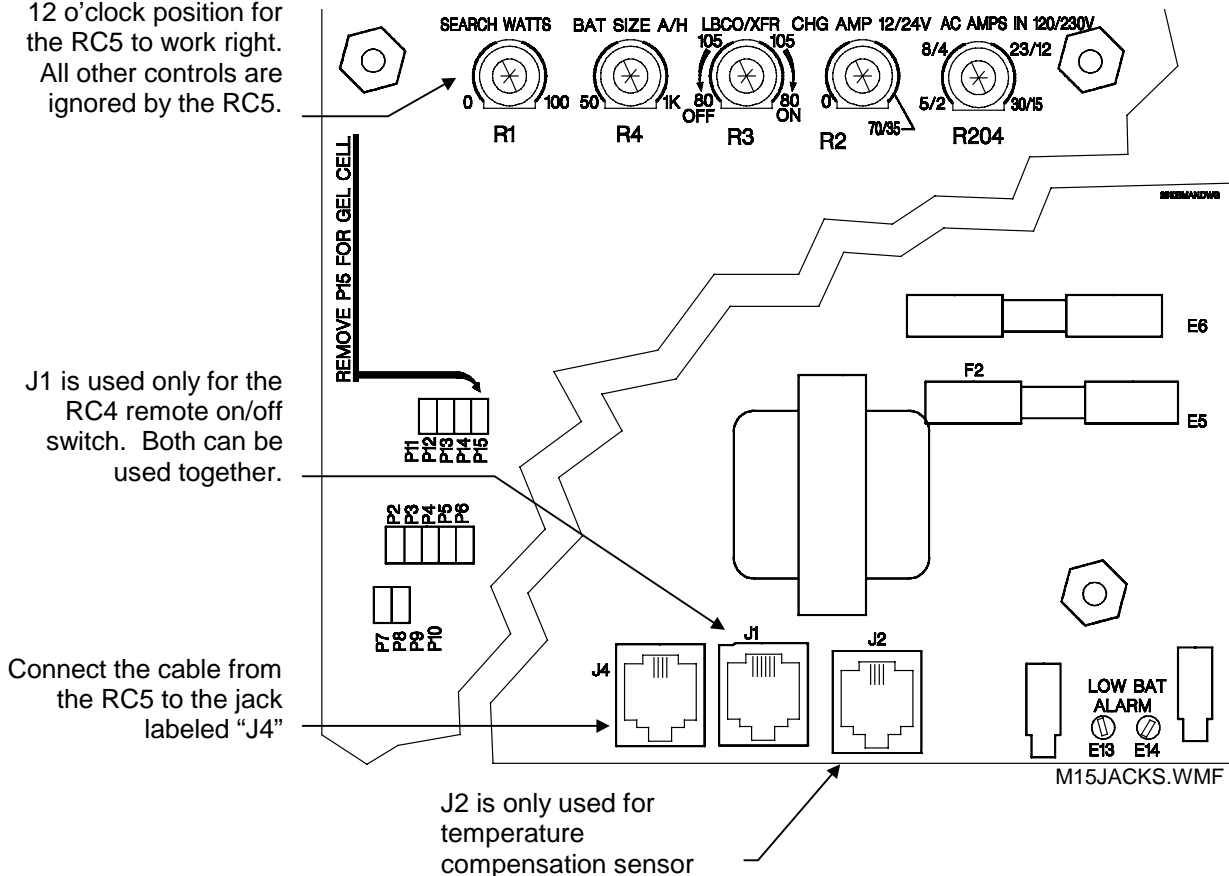
Extending the RC5's Cable

The RC5 includes a 50 foot cable for connection to the inverter. The cable is a specially made for Trace Engineering using stranded and tinned 26 gauge wires. This should be long enough for most applications. If you require additional cable length, the cable can be extended up to 150 feet with standard phone cable and a female-to-female connector. Do not use a second RC5 cable for the extension. Do not cut the cable if it is too long. Bundle and tie off the additional cable at a convenient location.

If you want to make a your own custom length cable, it must be made up to match the cable provided. **The RC5 requires that the cable's phone jack connectors be flipped in orientation from each other.** This only applies when you are not using the cable provided, not when you are simply extending the cable by adding a phone cable and a female-to-female connector. Examine the cable provided and duplicate it exactly.

You must protect the cable from damage by sharp edges and abrasion.

SEARCH WATTS (R1) must be set at the 12 o'clock position for the RC5 to work right. All other controls are ignored by the RC5.



Trouble Shooting

The display reads “Recycle Power to Inverter”.

If the inverter is operating, simply push the power switch on the front panel of the inverter. The communication link will be re-established between the inverter and the RC5. If the inverter ignores the RC5's control settings, simply push any key on the front panel of the RC5. The communication link will be re-established between the RC5 and the inverter. The RC5 has evidently become disconnected while operating the inverter.

Repeated problems with the RC5's communication link with the inverter is a sign of either a poor connection or damaged cable. Check the cable for breaks or cuts and reconnect. Replace the cable if the problem continues.

The display is blank.

Check the cable to the RC5 from the inverter. Make sure that the connectors are fully inserted and in the correct jack (J4). Examine the cable for damage such as cuts or breaks. Try replacing the cable with another RC5 cable (a standard phone cable will not work).

The settings have changed back to the default values.

Either the inverter has been disconnected from the battery or the RC5 has been disconnected from the inverter. You must reselect your settings on the RC5.

Be sure that the inverter is not disconnected from the battery when you select different battery banks by selecting the “BOTH” position and not the “OFF” when changing.

You can also set the internal controls to your preferred settings to allow the system to operate properly if the RC5 is disconnected or is not operational. The inverter defaults to its internal controls.

I extended the cable and the RC5 does not work now.

You must use the provided cable together with any extension cables required. A female to female connector will be required to connect the cables together. You can also cut the provided cable and splice in additional wire if you carefully match the wires back together.

Status Menu *The following is the information normally available to the system users*

Set Power To: Off	Set Power To: Standby (SPS)	Set Power To: Charger Only	System Status: Off	System Status: Searching	System Status: Inverting	System Status: Bulk Charging	System Status: Absorption Chg	System Status: Float Charging	System Status: HiBat/Stop Chg	System Status: Loba/Start Chg	System Status: Oem/PLess Load	System Status: Oload/less Load
Battery: 12.6 Volts	Battery: E	Battery: F	DC Current: 0 amps	AC Input: 0 Vac 0 Vpk	AC Output: 0 Vac 0 Vpk	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>Use the MENU ITEM buttons to move up and down vertically Use the SET POINTS buttons to move left and right horizontally Values in left most column are the DEFAULT values at startup</p> </div>						

Setup Menu To **ENTER** and **EXIT** the **SETUP MENU** press both the **MENU ITEM** buttons for 5 seconds

Search Sense: Default	Search Sense: About 5W load	Search Sense: 10W	Search Sense: 20W	Search Sense: 30W	Search Sense: 40W	Search Sense: >40W	Auto LBCO: On	Auto LBCO: Off	Bat Capacity: 50 Ahrs	Bat Capacity: 125 Ahrs	Bat Capacity: 250 Ahrs	Bat Capacity: 375 Ahrs	Bat Capacity: 500 Ahrs	Bat Capacity: 1000 Ahrs	Battery Type: Gel Cell	Battery Type: Liquid Lead Acid	Charge Rate: 100%	Charge Rate: 90%	Charge Rate: 80%	Charge Rate: 70%	Charge Rate: 60%	Charge Rate: 50%	Charge Rate: 40%	Charge Rate: 30%	Charge Rate: 20%	Charge Rate: 10%
Vac Dropout: 80 Vac	Vac Dropout: 85 Vac	Vac Dropout: 90 Vac	Vac Dropout: 95 Vac	Vac Dropout: 100 Vac	Vac Dropout: 105 Vac	Shore Pwr Amps: 30 a	Shore Pwr Amps: 25 a	Shore Pwr Amps: 20 a	Shore Pwr Amps: 15 a	Shore Pwr Amps: 10 a	Shore Pwr Amps: 5 a	RC5 Setup: Last Key	RC5 Setup: Power Saver	RC5 Setup: Rolling Display	LCD Contrast: Max Contrast	LCD Contrast: 87%	LCD Contrast: 62%	LCD Contrast: 50%	LCD Contrast: 37%	LCD Contrast: 25%	LCD Contrast: 12%	LCD Contrast: Min Contrast				